DANMARKS OG GRØNLANDS GEOLOGISKE UNDERSØGELSE RAPPORT 2003/48

PGE and sulphide phases of the precious metal mineralisation of the Skaergaard intrusion

Part 2: sample 90-24, 1057

T. F. D. Nielsen, H. Rasmussen, N. S. Rudashevsky,
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Contents

Abstract

The Paleaogene Skaergaard intrusion, 68^{o}N, in East Greenland hosts a large tonnage, low-grade, precious metal mineralisation. The Pd5 level of the mineralisation contains more than 20 million ounces of palladium and minor platinum and gold. The Pd:Pt:Au ratio is ca. 88:7:5.The report presents the results of mineralogical investigations of sample 90-24 1057 (core 90-24 from 1057 to 1058 meters) from the most palladium-rich one-meter interval in the main Pd-level in the mineralisation.

The non-magnetic heavy mineral concentrates from sample 90-24 1057 (0.78 kg) were subjected to separation using the HS-01 Hydroseparator technology. From the concentrates enriched in platinum group and Au minerals were prepared polished thin section. The thin sections were investigated under the scanning electron microscope and the electron micro probe. The magnetic concentrates contain no precious metal grains, except for rare grains intergrown with Fe-Ti-oxides. The assay of the sample suggests a combined Pd-Pt-Au concentration of ca. 3 g/t.

The sample was found to contain 374 precious metal grains, including 369 grains of platinum group minerals (PGMs) and only 5 grains of Au-minerals. The absolutely dominant PGM is “unnamed-PdCu” (94%) followed by minor “unnamed-$PdCu_3$” (3%). The grain size of PGMs and Au-minerals varies between 2 and 75 μm with an average of 22 μm.

The HS-concentrates contain numerous spherical sulphide grains identified as sulphide droplets. They are composed of one or more of the Cu-sulphides bornite, chalcopyrite, chalcosine and digenite. Some of these melt droplets contain grains or crystals of PGMs. The droplets occur mainly in relation to amoeboidal oxide-rich parts of the matrix and occasionally in the rims of liquidus phases.

Based on the petrographic observations the primary paragenesis consisted of sulphide droplets with grains of unnamed PdCu. Some of these grains appear to be immiscible metal melts inside the immiscible suphide droplets, others are very well develloped crystals. The entire range from amoeboidal grains to perfectly crystallised grains is found. The observations suggest that immiscible CU-Fe sulphide droplets formed as immiscible melt in iron-rich insterstitial melts, cooled and crystallised mainly bornite contemporaneously with the formation of immiscible Pd-Cu melts. The latter cooled to crystallised “unnamed PdCu” and all other phases from the elements not hosted in “unnamed-PdCu”, e. g., Pd-arsenides.

Introduction

This report describes the mineralogy of sample 90-24 1057 from the lower palladium horizon in the ”Platinova Reef” of the Skaergaard intrusion. The report consists of an introduction to the mineralisation and the investigated sample and a mineralogical report. The mineralogical report has been prepared by Rudashevsky et al. (2002) on the request of the geological Survey of Denmark and Greenland. Electron microprobe data collected in 1993 by H. Rasmussen (Geological Survey of Denmark and Greenland and Department of Geology at University of Copenhagen) are included as an appendix.

The mineralogical report is based on concentrates of platinum group metal phases produced using the patented Hydroseparator HS-1. Mounts with concentrate have been studied using electron microscopy and electron microprobe. The report gives descriptions of the analytical techniques, the grain characteristics, the parageneses and the compositional variation within the identified groups of minerals, alloys and sulphide droplets.

T.F.D. Nielsen has edited the report.

The Platinova Reef of the Skaergaard intrusion

The Skaergaard intrusion precious metal mineralisation, often referred to as the “Platinova Reef”, is a gabbro-hosted, stratiform Au and PGE mineralisation in the macrorythmic Triple Group of the Skaergaard intrusion (Bird et al., 1991). The Triple Group forms the upper c. 100 meters of the Middle Zone in the Layered Series of the intrusion. The host rocks are well-preserved oxide-rich tholeiitic gabbros.

The mineralisation was located in 1987 by Platinova Resources Ltd. Exploration was conducted by Platinova Resources Ltd. and partners from 1986 to 1990. Exploration drilling was carried out in 1989 (DDH 89-01 to DDH 89-9b) and in 1990 (DDH 90-10 to DDH 90-27). Exploration results are summarised in Watts, Griffis and McOuat, 1991.

The general structure of the Platinova reef mineralisation is described in Andersen et al. (1998) and in Nielsen (2001). Peak concentrations of Au and Pd are separated by less that 1 meter at the margin of the intrusion, but by >60 meters in the south, central part of the intrusion.

The mineralisation consists of a series of levels enriched in Pd. The lower Pd5 level reaches across the intrusion. Up the stratigraphy subsequent Pd-levels have ever-decreasing lateral extend from a central axis in the south central part of the intrusion. Gabbros between the Pd-levels are not mineralised. The structure is best visualised as a series of bowl-shaped Pd-levels of decreasing size. Gold is concentrated at the edges of the bowls. Nielsen (2001) gives further descriptions.

The Pd5 level in the mineralisation is estimated to contain in excess of 300 million tons of gabbro with *c.* 2 g/t PGE over a width of 5 meters. The Pd5 mineralisation alone is sugested to contain > 20 million ounces of precious metals equivalent to >600 tons of palladium, >40 tons of platinum and >30 tons of gold (Nielsen, 2001).

The Pd5 level

The Pd5 level contains the main Pd mineralisation and is located within a macrorythmic layer located below L1 of the Triple Group. The leucogabbro layer in the megacycle below L1 is unofficially named L0.

The Pd variation across Pd5 is quite characteristic and paralleled in all investigated cores and chip lines from the intrusion. Relative changes in Pd/Pt can be correlated across the intrusion (see Nielsen, 2001).

The hanging wall 1 g/t cut-off of the mineralisation is located in the middle of L0 and the foot wall 1 g/t cut-off is located at the density peak below L0. In most cores the distance between foot wall and hanging wall is 5 meters (based on 1-meter average concentrations of Pd). The Pd variation over the 5-meter mineralisation interval is paralleled in all cores from a 19 km^2 area (Nielsen, 2001). The Pd concentration increase slowly from 1 g/t over the first 3 meters, to levels of 3-6 g/t at c. 4 meters above the foot wall before Pd rapidly decreases to less that 1 g/t above the hanging wall 1 g/t cut-off (Nielsen, 2001).

Sample 90-24, 1057

Sample 90-24 1057 was collected from BQ drill core # 90-24. The core was drilled with an azimuth of 0^o and an inclination of –70 from a location at 504 meters a.s.l., on the western slope of Basistoppen. The Hanging wall of the mineralisation (1 g/t cut-off) is located at 1055 meters and the foot wall at 1060 meters.

Sample 90-24, 1057 collects the 1 m interval with the highest Pd concentration in the Pd5 level between 1057 and 1058 m. The average Pd concentration between 1057 meters and 1058 meters is 2.8 g/t Pd and an average of combined PGE plus Au of 3.1 g/t.

The recovery between 1057 and 1058m is c. 80 %. The core has previously been sampled for other purposes. The sample collects 1/3 of the diameter of the preserved core.

Sample	From	To	Length	Au	Pd	Pt
GEUS	m	m	m	average	average	average
				ppb	ppb	ppb
90-24 1053	1053.00	1054.00	1.00	24	720	20
90-23 1054	1054.00	1055.00	1.00	20	460	20
90-24 1055	1055.00	1056.00	1.00	52	1000	90
90-24 1056	1056.00	1057.00	1.00	112	2000	190
90-24 1057	1057.00	1058.00	1.00	97	2800	120
90-24 1058	1058.00	1059.00	1.00	57	1800	180
90-24 1059	1059.00	1060.00	1.00	30	1200	110
90-24 1060	1060.00	1061.00	1.00	12	970	150
90-24 1061	1061.00	1062.00	1.00	12	630	90

Data from Watt, Griffis and McOuat, 1991

The mineralogical investigation

The mineralogical investigation has been carried out by N.S. Rudashevsky, Yu.L. Kretser and V.N. Rudashevsky on request from the Geological Survey of Denmark and Greenland. The mineralogical report has been prepared by N.S. Rudashevsky, Yu.L. Kretser and V.N. Rudashevsky and edited by T.F.D. Nielsen.

Additional electron microprobe data

During a Ph.D. study Henrik Rasmussen (GEUS) collected a suite of microprobe analyses from a thin section at 1057.55 meters (thin section # 90-24 1057.55). The data is shown in Appendix 2. In the appendix the names of phases are suggested purely on the basis of their compositions.

References

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Watts, Griffis & McOuat 1991: 1990 Skaergaard project, Platinova/Corona concession, East Greenland, 55 pp. with appendixes in volumes 2A, 2B, 3A and 3B (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20848).

Mineralogical investigation

Rudashevsky, N.S., Kretser, Yu.L. and Rudashevsky, V.N.
Edited by T.F.D. Nielsen.

Introduction

The sample

Drill core sample 90-24, 1057 (0.78 kg by weight) of oxide-rich tholeiitic gabbro with Pd mineralisation from the Skaergaard intrusion was provided for the investigation by T.F.D. Nielsen (Geological Survey of Denmark and Greenland). Assays reported by Watts, Griffis and McOuat (1991) indicate concentrations of 170 ppb Pt, 2800 ppb Pd, 97 ppb Au in that particular core interval. In addition, one thin section (90- 24 1057.14) was provided for optical investigation.

Analytical techniques

Analytical techniques are described in Nielsen et al. (2003): PGE and sulphide phases of the precious metal mineralisation of the Skaergaard intrusion, Part 1: sample 90-23A 807.

Results

Rock forming minerals and sulphide mineralogy

Silicates and oxides

The silicates and oxides related to suphides and PGE phases are: 1) *plagioclase*, An_{44-49} (Table 1, analyses 1-6), 2) monoclinic ferrous *pyroxene*, Mg# = 060-0.63 (Table 1, analyses 7-13), 3) orthorhombic ferrous *pyroxene*, Mg# = 0.53-0.49 (Table 1, analyses 14-17) and 4) Fe-Ti oxides including ilmenite (Table 1, analyses 21, 23 and 25) and titaniferous magnetite (Table 1, analyses 20, 22 and 24; Plate 1, #1). Monoclinic and orthorhombic pyroxenes form typical exsolution textures (Plate 1, #2-15; Table 1, analyses 12-15).

The Fe-Ti-oxides occur as aggregates of 1-3 mm, anhedral grains. They fill the space between the grains of plagioclase and pyroxenes (Plate 1, #1, 5-8). Some fine grains of Fe-Ti-oxides (<20 μm) have the form of droplets (Plate 1, #2, 4, 7, 8). They occur as inclusions in pyroxenes, as well as in plagioclase.

In general, silicates in contact with Fe-Ti-oxide aggregateshave reaction rims:

1) clinopyroxene is rimmed by fayalite, Mg# 0.43 (Tabl. 1, analyses 18 and 19) and anorthite An_{89} (Table 1, analysis 6; Plate 1, #1),
2) orthopyroxene is rimmed by actinolite (Plate 1, #1),
3) plagioclase is rimmed by hornblende (Plate 1, #5).

Fe-Ti-oxides are mostly associated with H_2O-bearing minerals such as biotite (Plate 1, #7; Table 1, analysis 26), epidote and chlorite.

It is important to note that regular exsolution textures in pyroxens grains (clinopyroxene+orthopyroxene) are disturbed round inclusions of Fe-Ti –oxides (Plate 1, #2) and sulphides (Plate 1, #3, 6-14). Clinopyroxene exsolutions have been lost in a zone surrounding the inclusions (Plate 1, #2-14). Sulphide aggregates, as well as grains of Fe-Ti–oxides are closely intergrown with H_2O-bearing minerals - biotite, ampiboles, chlorite etc (Plate 1, #1, 5, 10; Plate 2, #13). Calcite is sometimes located at the rims of sulphide microglobules (Plate 2, #13).

Sulphides

Despite of the high concentrations of PGE (~3 ppm), these rocks are relatively poor in sulphides – the content of sulphides of Cu and Fe is less than 0.1 %. The aggregates of sulphides less than 0.1 mm in diameter occur between rock-forming minerals. The sulphide grains are mostly found at the rims of Fe-Ti–oxide and pyroxene grains (Plate 1, #3, 7, 8). The inclusions of Cu-Fe sulphides in ilmenite (Plate 1, #4) and titaniferous magnetite (Plate 1, #5) crystals, as well as in pyroxenes (Plate 1, #6-14) and plagioclase (Plate 1, #15) are generally aggregates of several Cu-Fe phases. As observed in the polished sections, sulphides usually have irregular shapes (Plate 1, #3, 5-15), sometimes with rounded or droplet-like outline (Plate 1, #4).

The nonmagnetic heavy concentrates are ilmenite-rich products (> 90 %) enriched in grains of sulphides and precious metal minerals. The sulphides grains include irregular grains and numerous droplet-like microglobules (up to 0.1 mm) of the Cu-Fe sulphides (Plate 2, #1-13), some of which are spherical (Plate 2, #7).

More than 300 grains of PGE-bearing sulphide aggregates were found in the heavy concentrate. The sulphide grains and aggregates are dominantly composed of bornite and chalcosine group minerals (see Plates 3-7). The volume ratio varies significantly from grain to grain (see Plate 2). In the microglobules bornite and chalcosine group minerals formed classical exsolution textures (Plate 1, #12; Plate 2, #1-11).

The average chemical composition of bornite in 19 different grains and aggregates (Table 2) is almost stoikiometric: $Cu_{4.96}Fe_{1.02}S_{4.02}$. The chalcosine group minerals were analysed in 42 sulphide globules. They divide into two minerals (see Table 2):

1) *chalcosine* (31 grains): The average compositions (n=31) is Cu =78.0±0.4, Fe=1.1±0.2, S=20.1±0.2, Total=99.2 (wt.%), equivalent to $(Cu_{1.97}Fe_{0.03})_{2.00}S_{1.00,}$

2) *digenite* (11 grains): The average compositions (n=11) is Cu=76.9±0.5, Fe=1.1 ±0.3, S=21.2 ± 0.2, Total 99.2; equivalent to $(Cu_{8.96}Fe_{0.15})_{9.11}S_{4.89}$.

In the the sulphide microglobules were also found:

1) *chalcopyrite* (in 3 % of the studied particles; see Table 2, analyses 64; Plate 3, #75, 76, 88 and 92; Plate 4, #1, 32 and64; Plate 5, #74; Fig. #6 and 17; Plate 7, #12),
2) *Co-bearing pentlandite* (Plate 2, #8; Plate 6, #24; Table 2, analysis #65),
3) *Co-pentlandite* (Plate 4, #23; Table 2, analysis #66),
4) *sphalerite* (Plate 4, #35; Table 2, #68).

PGMs and Au-minerals: recovery, grain size and relations to host rock

Recovery

PGMs have been identified by SEM in polished section (24-1057.14) and a section produced from the coarse fraction of the milled sample. Twelve grains (2-7 μm) and one larger grain (20x30 μm) of precious metal minerals were found in the close relationship with Cu-Fe-sulphides. They occur a as inclusions in the rock-forming minerals:

1) *titaniferous magnetite* (Plate 1, #5),
2) *ilmenite,*
3) *pyroxenes* (Plate 1, #7, 8, 13 and 14),
4) *plagioclase* (Plate 1, #15).

Twelve of the 13 PGM grains are the unnamed mineral - PdCu (Plate 1, #7, 8, 13, and 14; see Table 4, analyses 1-8). The last grain is an unnamed mineral with the composition $PdAuCu_2$ (Plate 1, #14). Keithconnite occurs as an inclusion in one of the PdCu grains (not illustrated).

In contrast the heavy mineral concentrates have yielded a wide range of minerals including 373 grains of PGMs and Au-minerals (Table 3). In total 11 different precious metal minerals are documented in sample 90-24, 1057. They include:

1) *unnamed-PdCu* (354 grains),
2) *unnamed-$PdCu_3$* (12 grains plus 7 inclusions in PdCu),
3) *unnamed-$PdAuCu_2$* (5 grains plus 4 inclusions in PdCu),
4) *unnamed (Pd,Cu,Sn)-alloy* (3 grains and 12 inclusions in PdCu).

Other PGM minerals occur as inclusions in the main PGM phases:

1) *keithconnite* as inclusions in 11 grains of PdCu and $PdAuCu_2$,
2) *vasilite* as inclusions in 5 PdCu and in one $PdAuCu_2$ grain,
3) *zvyagintsevite* as inclusions in 3 PdCu grains,
4) *tetraferroplatinum (?)* as inclusions in 2 PdCu grains,

5) *hongshiite* (?) as inclusion in a PdCu grain,
6) *unnamed-(Pt,Pd)Cu$_3$* as inclusion in a PdCu grain,
7) *bogdanovite* as inclusion in a $PdAuCu_2$ grain. (Table 3).

No magnetic PGMs found in magnetic fraction -45 μm.

Grain size

Grain sizes, as measured by the effective diameter of the grains (for definition see Nielsen *et al.*, 2003), vary from c. 2 to 75 μm with an average of 22 μm (Table 3; Fig. 2b). As shown in the grain size distribution plots (Fig. 2*a-c*) the PGM and Au-minerals are distributed as follows:

Grain size, μm	Number of grains
2-6	7
6-10	30
10-40	290
40-63	37
63-76	4

The SEIs (scanning electron images) show that the majority of these grains are well preserved and have kept their primary shape and size (Plate 3-7). The grains have not been broken during the production of the concentrates. The by far largest proportion of PGM grains are concentrated in the nonmagnetic –45my fraction.

The volumetric proportions are calculated from the effective diameters. The volume proportions of the dominant groups of precious metal minerals (Table 3 and Fig. 1) are:

Mineral	Volumetric proportion, %
Unnamed-PdCu	94-95
Unnamed-$PdCu_3$	3
Au-Pd-Cu mineral phases	1
Unnamed (Pd,Sn,Cu)-alloy	1
others (keithconnite, vasilite, Pt-Fe-Cu-alloys)	<1

Petrographic observations

A perfect separation of accessory minerals has been achieved in the gentle disintegration of the studies sample. The method of disintegration allows the preservation of the grains and the recovery of the most important information on the genesis of the minerals. The concentrates provide full information for the reconstruction of the primary shapes and sizes of accessory minerals, together with their mineral paragenesises and relationships with the matrix minerals of the rock.

The PGE- and Au-mineral grains most commonly occur as intergrowths with each other and with the above-mentioned Cu-Fe sulphides, bornite, chalcosine, digenite and chalcopyrite (Plates 3-7). Based on the SEIs, the PGMs and Au-minerals in the heavy concentrates divide three different groups:

1) grains containing unnamed-PdCu (Plates 3-5),
2) grains with unnamed-$PdCu_3$, unnamed (Pd,Cu,Sn)-alloy and zvyagintsevite (Plate 6),
3) grains with Au-minerals, keithconnite, vasilite and Pt-alloys (Plate 7).

Description and chemistry of PGMs and Au-minerals

Unnamed-PdCu

Description

Grains of unnamed-PdCu are in the concentrates found as:

a) grains of matrix minerals with inclusions of unnamed-PdCu. The inclusions have preserved primary shapes (Plate 3),
b) grains with inclusions of unnamed-PdCu, that were partly broken during disintegration pro-cess of the sample (Plate 4),
c) almost totally liberated grains of unnamed-PdCu (Plate 5).

PGM-bearing sulphide grains can be either droplet-like or irregular-shaped aggregates (Plates 3, 6 and 7). The grains and droplet are generally composed of PGM phases and Cu-Fe sulphides, but some also contain silicates, Fe-Ti oxides or hydrous phases (see below).

Droplets and globules

Several types of droplet or microglobules have been identified by SEI:

1) classic and common PGM-bearing sulphide “droplets” or microglobules (Plate 3, #12, 16, 17, 28, 31, 37, 42, 46, 49, 51-53, 61, 75, 80, 86, 88 and 93; Plate 6, #9, 11, 14, 30 and 32; Plate 7, #1, 5, 17, 22-23, etc),
2) very fine “droplets” (1-5 μm) distributed throughout all the volume of Cu-Fe sulphide grains (Plate 3, #*14 and 80*).

Quite often the PGE-phases are localised at the margin of sulphide globules (Plate 3, #11-13, 15, 16, 18, 20, 21, 23-32, 34-36 and 39-76; Plate 6, #8, 9-13, 18-2 and, 30; Plate 7, #1, 5, 9, 17, 23, etc). In the droplets and globules the PGM phases may occur as:

1) droplets (Plate 3, #11-14, 16-17, 29, 31, 39-43, 46-57, 60-61, 63 and 80; Fig, 4, #3, 4, 20, 24, 26 and 30-35; Plate 6, #1, 5, 8, 18, 19 and 30; Plate 7, #9, etc),
2) isometric grains with the rounded outlines (Plate 3, #66-79 and 84-95; Plate 4, #47-52, 51-61 and 73-81; Plate 5, #2, 5-6, 9-12, 17-20, 27-31, 36, 38, 40, 47, 49-50, 53, 54, 62-66, 70, 74, 76, 77, 93 and 94; Plate 6, #2, 11, 16, 25-26 and 28-29; Plate 7, #2-4, 6-7, 11, etc.),
3) euhedral crystals or partially euhedral grains (Plate 3, #7, 9, 19, 24, 34-35 and 88; Plate 4, #16, 21-22, 29, 49-50, 53, 55, 57, 64, 67-68 and 70; Plate 5, #34, 41-42, 58, 61-62, 78 and 83; Plate 6, #27 and 33-35; Plate 7, #1, 11, 15, etc.),
4) irregular grains (Plate 3, #4, 22, 30, 32, 37-38, 64, 81-83, 86 and 91; Plate 4, #5, 8, 9, 11, 18, 19, 27-28, 48, 61, 65-66, 69 and 72-73; Plate 5, #3, 4, 8, 14, 23, 25-26, 37, 59, 69, 72, 87 and 91; Plate 6, 3, 7, 10, 13-15, 17 and 20; Plate 7, #8, 12-14, 16, 18-23, etc.).

Volume porportions
The volume proportion of PGE-phase in PGM-bearing sulphide globules varies significantly and the globules can be divided into:

1) sulphide globules with fine inclusions of PGMs (Plate 3, #1, 2 and 9-63; Plate 6, #11, 12, 14, 18-19 and 30; Plate 7, #23, etc.),
2) globules where PGE-phase compose half the volume or more (Plate 3, #76-80; Plate 6, #9; Plate 7, #5-7, 17, 22, etc.),
3) globules dominated by PGE-phase(s) (Plate 3, #81-95).

Shapes of grain boundaries
The contact between PGE phases and Cu-Fe sulphides are normally sharp; protuberant for PGE-phase and concave for Cu-Fe sulphides (Plate 3, #11-36, #39-63, #66-80, #84-85 and #88-95; Plate 6, #9, 11, 18-19 and 30; Plate 7, #1, 3, 5-7, etc.). Exceptions to this general rule are some sulphide globules (less than 3 %), where PGM-inclusions form aggregates with sinuous outlines enclosed in Cu-Fe sulphide (Plate 3, #37-38, 64 and 81-82; Plate 4, #72 and 73).

Intergrowth with silicates and other phases
The sulphides and PGMs of PGM-bearing globules may be intergrown with rock-forming minerals such as:

1) *orthopyroxene* (Plate 3, #4, 8 and 9; Plate 4, #3 and 5; Plate 5, #3-4; Table 1, analyses 31-33),
2) *clinopyroxene* (Plate 3, #2; Plate 4, #3 and 5; Plate 5, #3 and 4; Table 1, analyses 29- 30),
3) *plagioclase* (Plate 4, #1 and 2; Plate 5, #5 and 6; Tabl.e1, analyses 27-28),
4) *ilmenite* (Plate 3, #3-6; Plate 4, #6; Plate 5, #7-8; Table 1, analyses 34-35),
5) *titaniferous magnetite and magnetite* (Plate 2, #1 and 5; Plate 3, #1, 7, 11, 12, 21, 26, 30, 31, 32, 85 and 86; Plate 4, #7, 28, 53, 54, 56 and 76; Plate 5, #2, 9, 10, 11 and 86: Plate 6, #5, 22 and 28; Plate 7, #19 and 23; Table 1, analyses 36-43).

There are also characteristic intergrowths of Cu-Fe-sulphides and PGMs with H_2O-bearing minerals and carbonates such as:

1) *chlorite* (Plate 2, #13; Plate 3, #25, 45, 64, 83 and 91; Plate 4, #8, 18, 33 and 65; Plate 5, #12; Table 1, analyses 46-47),
2) *biotite* (Plate 3, #8, and 13),
3) *hornblende* (Plate 3, #10; Table 1, analysis 44),
4) *actinolite* (Plate 3, #8),
5) *epidote* (Plate 4, #2; Table 1, analysis 45),
6) *calcite* (Plate 2, #5 and 13; Plate 3, #35),
7) *ancerite* (Plate 7, #16).

The paragenesis

The dominant unnamed-PdCu phase is in sample 90-24, 1057 found in the heavy concentrate as droplet-like, anhedral grains to euhedral crystals. They vary in size from ca. 2 to 75 μm, with an average of 22 μm (Table 3, Plates 4-6).

Most of the grains are not associated with other PGMs (Plates 4-6), but some rare grain-intergrowths with unnamed-$PdCu_3$ (in ca. 5%) of investigated PGM grains (Plate 6, #4-9 and 15-18) and other phases have also been found. Unnamed PdCu seems to be the main phase of these grains (Plate 6, #8 and 17-18). $PdCu_3$ and other rare phases either replaced or were exsolved from unnamed-PdCu. This suggests that unnamed-PdCu pre-dates $PdCu_3$.

PdCu is also found in intergrowth with:

1) *unnamed (Pd,Cu,Sn)-alloy* (Plate 6, #21-32),
2) *unnamed-$PdAuCu_2$* (Plate 7, #4-7, 10, and 11),
3) *keithconnite* (Plate 7, 13-19), vasilite (Plate 7, #18, 19, 21),
4) *zvyagintsevite* (Plate 6, #33-35),
5) *(Pt-Fe-Cu-Pd)-alloys* (Plate 6, #19; Fig.7, #22).

All the above mentioned rare PGMs are usually localised at the edge parts of the grains-intergrowths or occur as very small inclusions in unnamed-PdCu.

Mineral chemistry

The chemical composition of unnamed-PdCu has been established in 326 microprobe analyses (Table 4). Unnamed-PdCu is composed of 9 elements that vary over a wide range of concentrations (Fig. 3):

Element	Maximum (wt%)	Minimum (wt%)
Pd	64.4	33.0
Pt	12.7	0.0
Au	31.5	0.0
Cu	43.5	15.8
Fe	7.3	0.0
Zn	7.2	0.0
Sn	21.4	0.0
Te	4.7	0.0
Pb	5.5	0.0

The analysis of the binary correlation coefficients of these mineral-forming elements, as well as their atomic radii, suggests the following substitutions in the crystal structure of the unnamed-PdCu:

1) Pd is replaced by Au and Pt,
2) Cu is replaced by Fe, Zn, Sn and Te.

The sum of atomic proportions of (Pd+Pt+Au) varies between 41 and 53% (Table 4). On average, atomic (Pd+Pt+Au) in all analyses of unnamed-PdCu (Table 4) sum to 0.999 ± 0.003. In the Pd-Cu phase diagram (at <500^{o}C) such a composition corresponds to the stability field of the β–phase of PdCu. β–PdCu is cubic and has a CsCl-type crystal structure with a = 2.973 Å (Savitsky, 1984).

The analysis of the Factor loadings plot diagram for the all the analyses of unnamed-PdCu (Table 4) allows identification of 4 contrasting compositional groups of unnamed-PdCu. (Fig. 4):

1) characteristic elements: Pd, Fe and Zn (main group),
2) characteristic elements: Cu, Au and Te (Factor 1),
3) characteristic elements: Sn and Pb (Factor 2),
4) characteristic elements: Pt, less common Sn and Fe (Factor 3).

Unnamed-$PdCu_3$

Description

The grains of unnamed-$PdCu_3$ vary from 5 to 50 μm, with an average size of 16 μm (Table 3, Plate 6, #1-18 and 20). The shape of grains is droplet-like (Plate 6, #1, 2, 5, 8-9, 11, 16 and 19) or irregular (Plate 6, #3, 4, 6, 7, 10, 12-15 and 17). As PdCu, $PdCu_3$ is generally found in PGM-bearing sulphide globules or droplets (Plate 6, #9, 11-12, 14 and 18) or as fragments of globules and droplets (Plate 6, #2, 4, 7, 8, 10, 13, 15, 17 and# 20). The monomineralic grains of unnamed-$PdCu_3$ (Plate 6, #1, 3, 5, 6 and 16) may be fragments of microglobules or grains originally enclosed in other phases. $PdCu_3$ has not been observed to be related to any other PGMs than PdCu (Plate 6, #11-14 and 20). It is only observed to form intergrowths with unnamed-PdCu (Plate 6, #4, 9 and 15-18), but $PdCu_3$ may contain inclusions of Pd-Cu-Sn alloy (Fig.6, #1 and 3).

Mineral chemistry

Microprobe analyses show that $PdCu_3$ has a wide compositional (Table 5, analyses 1-13). The analysed grains contains up to 12.1 % of Pt (Table 5, analysis 5), up to18.4 % of Au (Table 5, analysis 7), up to 1.1 % of Fe (Table 5, analysis 10) and up to 1.9 % of Pb (Table 5, analysis 5).

Pt and Au replace Pd and Fe, and Pb replace Cu in its structure. The sum (Pd+Pt+Au) of the studied compositions has the interval of 13 to 27 at.%. In the Pd-Cu phase diagram (at 500^{o}C) such compositions correspond to the stability fields of α_1 and α_2 tetragonal phases with a Cu_3Au-type crystal structure (Savitsky, 1984).

Unnamed (Pd,Cu,Sn)-alloy

Description

The unnamed (Pd,Cu,Sn)-alloy is found in intergrowths with unnamed-PdCu (Plate 6, #21-27), or as inclusions in unnamed-PdCu (Plate 6, #28-31). It only forms anhedral grains with grain sizes from 3 to 22 μm. The average size is 11 μm (Table 3).

Mineral chemistry

Unnamed (Pd,Cu,Sn)-alloy shows a wide compositional range (Table 5, analyses 15-26) with (wt%) Pd 56.5-68.4, Cu 10.3-21.4, Sn 11.5-23.2, Pt up to 4.9, Au up to1.7, Fe up to 2.3, Pb up to 1.6. Unnamed-PdCu in intergrowths with unnamed (Pd,Cu,Sn)-alloy always shows admixtures of Sn (from 1.6 % up to 15.2 %; Table 4, analyses 16, 24, 33, 36, 84, 114, 152, 191, 197, 261 and 265).

Other PGMs

Rare PGMs (Table 3 and 5) in the studied sample include:

1) *keithconnite* (Table 3; Plate 7, #6, 7, 9 and 13-19; Table 5, analyses 27-36),
2) *vasilite* (Table 3; Plate 7, #8 and 18-21; Table 5, analyses *37-42*),
3) Pt-Fe-Cu-Pd alloys (Table 3) including:
    a) *tetraferroplatinum* (Plate 7, #22-23; Table 5, analyses 44 and 46),
    b) *hongshiite* (Plate 6, #19; Table 5, analyses 45),
    c) *unnamed-(Pt,Pd)*Cu_3 (Plate 6, #19) (Table 5, analyses 47),
4) *zvyagintsevite* (Table 3; Plate 6, #*33-35*; Table 5, analysis 43).

They have all been found in the matrix grains of unnamed-PdCu or unnamed-$PdAuCu_2$. Pt-alloys as well as Au-alloys occur as inclusions in PGM-bearing sulphide globules (Plate 6, #*19*; Plate 7, #*22-23*).

Keithkonnite and vasilite are, as a rule, closely associated with unnamed-$PdAuCu_2$ and (Pd,Au)Cu. PdCu grains with inclusions of keithconnite, have admixtures of 0.8-4.7% Te (Table 4, analyses 60, 66, 116, 125, 231 and 266). Likewise, unnamed-PdCu with inclusions of Pt-Fe-Cu-Pd alloys, has admixture of 3.1-12.7 % Pt (Table 4, analyses 138, 161 and 164).

Au minerals

The Au-minerals (Table 3 and 6) in the concentrates of sample 90-24 1057 include the following rare alloys

1) *bogdanovite* $(Au,Pd)_3Cu$ (Plate 7, #12; Table 6, analysis 10),
2) *unnamed-*$PdAuCu_2$, possibly a new mineral (Plate 7, #4-12; Table 6, analyses 1-9).

Grains of Au-minerals vary from 9 to 25 μm, with an average of 18 μm (Table 3). Unnamed-$PdAuCu_2$ occurs together with unnamed-PdCu (Plate 7, #4-7 and 10-11) and keithconnite (Plate 7, #6, 7 and 9) in the droplet-like PGE- and Au-bearing sulphide globules. Some rare intergrowths of unnamed-$PdAuCu_2$ with vasilite (Plate 7, #8) and bogdanovite and chalcopyrite (Plate 7, #12) have been found. Unnamed-PdCu in intergrown with Au-minerals contains between 10.9 % and 30.7 % Au (Table 4, analyses 94, 95, 120, 153, 218, 234 and 242).

Bulk composition of sample 90-24 1057

The relative concentrations of Pd, Au and Pt in sample 90-24 1057 can be calculated from the total concentration of precious metals, the determined recovery, the modal proportions and the chemical compositions (Table 4-6). The estimated bulk compositions in the sample (assays of whole rock in brackets) are: Pd 2895 (2800), Au 129 (120) and Pt 58 (97) ppb.

Discussion

The PGM and Au-mineral paragenesis

The extensive data shows that the dominant PGM in the studied sample is "unnamed-PdCu". Unnamed-PdCu shows a wide compositional range (Table 4). Its composition depends on the PGM and Au-mineral paragenesis (Plates 6-7; Fig. 4). The defined compositional groups of PdCu and the associated PGMs and Au-minerals are correlated as follows:

a) PdCu enriched in Au-(Te) coexist with $PdAuCu_2$, bogdanovite and keithconnite,
b) PdCu enriched in Sn-(Pb) coexist with (Pd,Cu,Sn)-alloy and zvyagintsevite,
c) PdCu enriched in Pt coexist with Pt-Fe-Cu-Pd alloys.

All the observations and the inter-grain relations (Plates 6 and 7) suggests that all the PGMs and Au-minerals are part of a single paragenesis.

Order of crystallisation

The Cu-Fe sulphides and PGMs are synchronous and crystallised later than rock-forming minerals: plagioclase, clinopyroxene, othopyroxene, ilmenite and magnetite (Plate 1, #3 and 6-15; Plate 3, #1-9; Plate 4, #1-7; Plate 5, #1-11).

The characteristic droplet shape of both the PGMs and the host sulphide (see Plate 3, #11, 42, 46, 53 etc.) suggestes that the sulphide droplets and the enclosed PGM droplets represent two immiscible melts: 1) a Cu-Fe sulphide melt and 2) a metal melt enriched in Pd and Cu that separated from the Cu-Fe melt.

Some of the matrix Fe-Ti-oxides formed, similar to the sulphide- and PGE droplets, after the crystallisation of bulk of the rock-forming minerals of the gabbro (Plate 1, #1). Reaction zones of fayalite, anorthite, hornblende and actinolite between Fe-Ti-oxides and other rock-forming minerals (Plate 1, #*1*) allow to assume that a residual Fe-Ti-phase was isolated and accumulated between the main rockforming minerals during the late stages of crystallisation.

These observations suggests that a residual Fe-Ti-oxide phase enriched in sulphide and metallic (PGE-rich) components separated during the crystallisation of the skaergaard magma.

The residual phase seems to have been enriched by fluid components, Cu, Au and PGEs. This is suggested by the characteristic associations of Fe-Ti-oxides and PGM-bearing aggregates of Cu-Fe-sulphide with H_2O-bearing silicates (chlorite, biotite, hornblende, actinolite, epidote) – (Plate 1, #1, 5, 7 and 10; Plate 2, #13; Plate 3, #8, 10, 45, 64 etc.; Plate 4, #2, 18, 73 etc.; Plate 5, #12, 37 etc). Evidently, the late stage reactions between this residual phase and the already crystallised pyroxene has caused the infringement of the regular two-pyroxene exsolution textures (Plate 1, #*2, 3 and 6-14*).

The, Fe-Ti-oxide, sulphide- and PGE-mineralisations are spatially and genetically related. However, they have different thermodynamic characteristics, e. g., temperatures of crystallisation. This may explain why the Fe-Ti component, the sulphide droplets, and the PGM and Au-mineral droplets were spatially separated during the final stages of crystallisation.

Summary

1. 374 grains of PGMs were concentrated from sample 90-24,1057 (0.78 kg) by HS-technology.

2. The totally dominating PGM in the sample is unnamed-PdCu (> 95 wt. % of PGMs). In addition was identified ten other precious metal minerals (unnamed-$PdCu_3$, unnamed-$PdAuCu_2$, unnamed (Pd,Cu,Sn)-alloy, keithconnite, vasilite, zvyagintsevite, bogdanovite, tetraferroplatinum, hongshiite and unnamed-$(Pt,Pd)Cu_3$. All the PGMs seem to belong to a single precious metal paragenesis.

3. Unnamed-PdCu, unnamed-$PdCu_3$ and unnamed-$PdAuCu_2$ and a unnamed (Pd,Cu,Sn)-alloy appear to be new minerals that may subsequently be presented to IMA for approval. Detailed mineralogical investigations, including collection of X-ray data and investigation of physical properties are recommended.

4. The dominating PGM, unnamed-PdCu, has a wide compositional range. In total, 326 analyses have been collected. Its composition is determined by its “local” PGM and Au-mineral paragenesis. Three characteristric compositional groups are identified: a) unnamed-PdCu enriched in Au-(Te) coexists with unnamed-$PdAuCu_2$, bogdanovite and keithconnite; b) unnamed-PdCu enriched in Sn-(Pb) coexists with alloy (Pd,Cu,Sn) and zvyagintsevite; c) unnamed-PdCu enriched in Pt coexists with Pt-Fe-Cu-Pd alloys.

5. Composite PGE-bearing sulphide grains consist of bornite, chalcosine and digenite. The sulphides commonly show form exsolution textures. Rare sulphides are pentlandite(Co), cobalt pentlandite and sphalerite.

6. The sulphide droplets often contain droplets of PGM phases and Au-minerals. The characteristic structure suggests the occurrence of two immiscible melts: 1) Cu-Fe sulphide melt and 2) metal melt enriched in Pd and Cu.

7. Matrix Fe-Ti-oxides, and PGM-bearing Cu-Fe sulphide are spatially and genetically closely related. The structures and relationships suggests isolation of a residual Fe-Ti-oxide phase enriched in Cu, Zn, Sn, Pb, PGE, Au, S, As, Te and H_2O crystallisation. From this residual phase formed Cu-Fe droplets in which PGE-enriched phases crystallised.

References

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Savitsky, E.M. 1984: *Metallurgy*. Moscow, 280-282; (in Russian).

Abbreviations

Abbreviations used in figures and tables.

Rock-forming minerals

PL	= plagioclase
AN	= anorthite
CPX	= monoclinic pyroxene (clinopyroxene)
OPX	= ortho rhombic pyroxene (orthopyroxene)
ILM	= ilmenite
TIMT	= titaniferous magnetite
MT	= magnetite
ACT	= actinolite
HB	= hornblende
BT	= biotite
EP	= epidote
CHL	= chlorite
OL	= olivine
FA	= fayalite
CT	= calcite

Sulphides

BORN	= bornite
CP	= chalcopyrite
CHC	= chalcosine
DGN	= digenite
PN-(Co)	= pentlandite-(Co)
COPN	= cobalt pentlandite
ZnS	= sphalerite

Precious metal minerals:

PdCu	= unnamed-PdCu
$PdCu_3$	= unnamed-$PdCu_3$
$PdAuCu_2$	= unnamed-$PdAuCu_2$
(Pd,Cu,Sn)	= unnamed-(Pd,Cu,Sn)-alloy
KTH	= keithconnite
VSL	= vasilite
ZV	= zviagintsevite
BGD	= bogdanovite
TFP	= tetraferroplatinum
HNG	= hongshiite
$(Pt,Pd)Cu_3$	= unnamed mineral phase

Table 1. *Chemical composition and formulas of silicates and oxides of oxide-rich tholeiitic gabbros (sample 90-24, 1057)*

An.	Object	Association of minerals	Mineral		SiO_2	TiO_2	Al_2O_3	V_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total
1	P.s.	PL+CPX+OPX+ ILM+TIMT	PL	**Wt.%**	**56.2**	**-**	**27.3**	**-**	**0.34**	**-**	**-**	**-**	**9.2**	**6.2**	**0.44**	**-**	**99.68**
				F. c.	2.54	-	1.45	-	0.01	-	-	-	0.45	0.54	0.03	-	O=8
2	P. s.	PL+CPX+OPX+ ILM+TIMT	PL	**Wt.%**	**56.3**	**-**	**26.9**	**-**	**0.59**	**-**	**-**	**-**	**9.7**	**6.0**	**0.48**	**-**	**99.97**
				F. c.	2.54	-	1.43	-	0.02	-	-	-	0.47	0.53	0.03	-	O=8
3	P. s.	PL+CPX+OPX+ ILM+TIMT	PL	**Wt.%**	**57.0**	**-**	**26.6**	**-**	**-**	**-**	**-**	**-**	**9.4**	**6.1**	**0.27**	**-**	**99.37**
				F. c.	2.57	-	1.41	-	-	-	-	-	0.46	0.53	0.02	-	O=8
4	P. s.	PL+CPX+OPX+ ILM+TIMT	PL	**Wt.%**	**54.5**	**-**	**29.3**	**-**	**0.44**	**-**	**-**	**-**	**10.2**	**5.3**	**-**	**-**	**99.74**
				F. c.	2.46	-	1.56	-	0.02	-	-	-	0.49	0.46	-	-	O=8
5	P. s.	PL+CPX+OPX+ ILM+TIMT	PL	**Wt.%**	**54.8**	**-**	**28.8**	**-**	**0.33**	**-**	**-**	**-**	**9.2**	**6.2**	**0.26**	**-**	**99.59**
				F. c.	2.48	-	1.54	-	0.01	-	-	-	0.44	0.54	0.02	-	O=8
6	P. s.	ILM+TIMT+OL(rim) +PL(rim)+CHL	PL	**Wt.%**	**42.8**	**-**	**36.7**	**-**	**1.2**	**-**	**-**	**-**	**17.8**	**1.4**	**-**	**-**	**99.9**
				F. c.	1.99	-	2.01	-	0.04	-	-	-	0.89	0.13	-	-	O=8
7	P. s.	PL+CPX+OPX+ ILM+TIMT	CPX	**Wt.%**	**50.7**	**0.58**	**2.0**	**-**	**-**	**14.3**	**0.33**	**12.2**	**19.1**	**-**	**-**	**-**	**99.21**
				F. c.	1.94	0.02	0.09	-	-	0.46	0.01	0.69	0.78	-	-	-	O=6
8	P. s.	PL+CPX+OPX+ ILM+TIMT	CPX	**Wt.%**	**50.4**	**0.73**	**1.6**	**-**	**-**	**16.1**	**0.36**	**13.3**	**17.5**	**-**	**-**	**-**	**99.9**
				F. c.	1.93	0.02	0.07	-	-	0.51	0.01	0.76	0.72	-	-	-	O=6
9	P. s.	PL+CPX+OPX+ ILM+TIMT	CPX	**Wt.%**	**49.8**	**0.59**	**1.2**	**-**	**-**	**15.7**	**0.30**	**13.7**	**17.8**	**-**	**-**	**-**	**99.09**
				F. c.	1.92	0.02	0.05	-	-	0.51	0.01	0.79	0.74	-	-	-	O=6
10	P. s.	PL+CPX+OPX+ ILM+TIMT	CPX	**Wt.%**	**51.8**	**0.74**	**0.79**	**-**	**-**	**13.1**	**-**	**12.6**	**20.7**	**-**	**-**	**-**	**99.73**
				F. c.	1.97	0.02	0.02	-	-	0.42	-	0.71	0.84	-	-	-	O=6
11	P. s.	PL+CPX+OPX+ ILM+TIMT	CPX	**Wt.%**	**50.2**	**0.74**	**1.6**	**-**	**-**	**13.4**	**0.37**	**13.1**	**20.4**	**-**	**-**	**-**	**99.81**
				F. c.	1.92	0.02	0.07	-	-	0.43	0.01	0.75	0.83	-	-	-	O=6
12	P. s.	CPX+OPX (exsol.)	CPX	**Wt.%**	**50.0**	**0.68**	**0.91**	**-**	**-**	**14.1**	**0.49**	**12.9**	**20.3**	**-**	**-**	**-**	**99.38**
				F. c.	1.93	0.02	0.04	-	-	0.46	0.02	0.74	0.84	-	-	-	O=6
13	P. s.	CPX+OPX (exsol.)	CPX	**Wt.%**	**51.5**	**1.1**	**1.1**	**-**	**-**	**12.8**	**0.53**	**12.3**	**20.6**	**-**	**-**	**-**	**99.93**
				F. c.	1.95	0.03	0.05	-	-	0.41	0.02	0.70	0.84	-	-	-	O=6
14	P.s.	OPX+CPX (exsol.)	OPX	**Wt.%**	**50.9**	**-**	**1.9**	**-**	**-**	**27.6**	**0.46**	**17.2**	**1.7**	**-**	**-**	**-**	**99.76**
				F. c.	1.96	-	0.08	-	-	0.89	0.01	0.99	0.07	-	-	-	O=6

Table 1 continued. *Chemical composition and formulas of silicates and oxides of oxide-rich tholeiitic gabbros (sample 90-24, 1057)*

An.	Object	Association of minerals	Mineral		SiO_2	TiO_2	Al_2O_3	V_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total
15	P.s.	OPX+CPX (exsol.)	OPX	**Wt.%**	**50.6**	**-**	**1.2**	**-**	**-**	**28.5**	**0.60**	**17.3**	**1.3**	**-**	**-**	**-**	**99.5**
				F. c.	1.96	-	0.06	-	-	0.92	0.02	1.00	0.05	-	-	-	O=6
16	P.s.	OPX+CPX+TIMT+ ILM+SPH	OPX	**Wt.%**	**49.8**	**0.30**	**-**	**-**	**-**	**27.1**	**0.63**	**18.6**	**2.9**	**-**	**-**	**-**	**99.33**
				F. c.	1.95	0.01	-	-	-	0.89	0.02	1.08	0.12	-	-	-	O=6
16	P.s.	OPX+CPX+TIMT+ ILM+SPH	OPX	**Wt.%**	**51.4**	**0.32**	**-**	**-**	**-**	**28.5**	**0.59**	**17.7**	**1.4**	**-**	**-**	**-**	**99.91**
				F. c.	1.98	0.01	-	-	-	0.92	0.02	1.02	0.06	-	-	-	O=6
17	P. s.	OPX+CPX+TIMT+ ILM+SPH	OPX	**Wt.%**	**51.6**	**0.32**	**-**	**-**	**-**	**30.3**	**0.79**	**16.3**	**1.0**	**-**	**-**	**-**	**100.31**
				F. c.	1.99	0.01	-	-	-	0.98	0.03	0.95	0.04	-	-	-	O=6
18	P.s.	ILM+TIMT+OL(rim) +PL(rim)+CHL	OL	**Wt.%**	**34.1**	**-**	**-**	**-**	**-**	**46.4**	**0.71**	**19.8**	**-**	**-**	**-**	**-**	**101.01**
				F. c.	0.99	-	-	-	-	1.13	0.02	0.86	-	-	-	-	O=4
19	P.s.	ILM+TIMT+OL(rim) +PL(rim)+CHL	OL	**Wt.%**	**34.0**	**-**	**-**	**-**	**-**	**46.2**	**0.57**	**19.4**	**-**	**-**	**-**	**-**	**100.17**
				F. c.	1.00	-	-	-	-	1.14	0.01	0.85	-	-	-	-	O=4
20	P.s.	TIMT+ILM (droplet)	TIMT	**Wt.%**	**-**	**6.4**	**4.7**	**1.0**	**50.2**	**38.0**			**-**	**-**	**-**	**-**	**100.3**
				F. c.	-	0.18	0.20	0.03	1.41	1.18			-	-	-	-	ΣK=3
21	P.s.	TIMT+ILM (droplet)	ILM	**Wt.%**	**-**	**48.4**		**0.28**	**6.2**	**42.2**	**0.77**	**0.32**	**-**	**-**	**-**	**-**	**98.17**
				F. c.	-	0.94		0.01	0.12	0.91	0.02	0.01	-	-	-	-	ΣK=2
22	P.s.	TIMT+ILM (exsol)	TIMT	**Wt.%**	**-**	**12.9**	**4.6**	**1.5**	**37.1**	**42.7**	**0.27**	**0.51**	**-**	**-**	**-**	**-**	**99.58**
				F. c.	-	0.36	0.20	0.05	1.03	1.32	0.01	0.03	-	-	-	-	ΣK=3
23	P.s.	TIMT+ILM (exsol)	ILM	**Wt.%**	**-**	**51.8**	**0.44**	**0.30**	**2.3**	**42.9**	**0.57**	**1.7**	**-**	**-**	**-**	**-**	**100.01**
				F. c.	-	0.97	0.01	0.01	0.04	0.89	0.01	0.06	-	-	-	-	ΣK=2
24	P.s.	PL+CPX+OPX+ ILM+TIMT	TIMT	**Wt.%**	**-**	**14.8**	**3.6**	**1.4**	**35.8**	**43.7**	**0.30**	**1.1**	-	-	**-**	**-**	**100.7**
				F. c.	-	0.41	0.16	0.04	0.99	1.34	0.01	0.06	-	-	-	-	ΣK=3
25	P.s.	PL+CPX+OPX+ ILM+TIMT	ILM	**Wt.%**	**-**	**51.1**	**-**	**0.20**	**4.3**	**41.1**	**0.55**	**2.5**	-	-	**-**	**-**	**99.75**
				F. c.	-	0.96	-	-	0.08	0.96	0.01	0.09	-	-	-	-	ΣK=2
26	P.s.	CPX+OPX+ ILM+TIMT+BT	BT	**Wt.%**	**33.7**	**4.5**	**14.2**	**-**	**-**	**21.0**	-	**14.0**	**-**	**-**	**7.8**	**0.34**	**95.54**
				F. c.	2.59	0.26	1.29	-	-	1.35	-	1.60	-	-	0.77	0.04	O=11
27	125-1, 9	PL+EP+CHC+ BORN+(Pd,Pt)Cu	PL	**Wt.%**	**50.0**	**-**	**31.7**	**-**	**0.61**	**-**	-	**-**	**14.0**	**3.1**	**-**	**-**	**98.41**
				F. c.	2.29	-	1.71	-	0.02	-	-	-	0.69	0.27	-	-	O=8
28	125-1, 15	PL+BORN+CP+ PdCu	PL	**Wt.%**	**55.9**	**-**	**28.0**	**-**	**-**	**-**	**-**	**-**	**9.6**	**4.5**	**0.27**	**-**	**98.8**
				F. c.	2.54	-	1.50	-	-	-	-	-	0.47	0.40	0.02	-	O=8

Table 1 continued. *Chemical composition and formulas of silicates and oxides of oxide-rich tholeiitic gabbros (sample 90-24, 1057)*

An.	Object	Association of minerals	Mineral		SiO_2	TiO_2	Al_2O_3	V_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total
29	75, 1	CPX+CHC+BORN +MT+PdCu	CPX	**Wt.%**	**51.2**	**0.38**	**0.56**	**-**	**-**	**15.3**	**0.24**	**10.3**	**21.6**	**-**	**-**	**-**	**99.58**
				F. c.	1.98	0.01	0.03	-	-	0.49	0.01	0.59	0.89	-	-	-	O=6
30	75, 87	CPX+BORN+PdCu	CPX	**Wt.%**	**51.8**	**0.51**	**0.56**	**-**	**-**	**12.2**	**0.23**	**13.8**	**20.1**	**-**	**-**	**-**	**99.20**
				F. c.	1.97	0.01	0.03	-	-	0.39	0.01	0.78	0.82	-	-	-	O=6
31	75, w.n.	OPX+CHC+BORN	OPX	**Wt.%**	**52.3**	**0.64**	**2.4**	**-**	**-**	**27.7**	**0.38**	**14.2**	**2.2**	**-**	**-**	**-**	**99.82**
				F. c.	2.00	0.02	0.11	-	-	0.89	0.01	0.81	0.09	-	-	-	O=6
32	75, w.n.	OPX+CHC+BORN	OPX	**Wt.%**	**50.3**	**0.57**	**0.55**	**-**	**-**	**29.4**	**0.66**	**17.1**	**1.0**	**-**	**-**	**-**	**99.58**
				F. c.	1.96	0.02	0.03	-	-	0.96	0.02	0.99	0.04	-	-	-	O=6
33	75, w.n.	OPX+CHC+BORN	OPX	**Wt.%**	**51.8**	**0.61**	**2.3**	**-**	**-**	**32.4**	**0.38**	**10.9**	**1.3**	**-**	**-**	**-**	**99.69**
				F. c.	2.02	0.02	0.11	-	-	1.06	0.01	0.63	0.05	-	-	-	O=6
34	75, w.n.	ILM+CHC+BORN	ILM	**Wt.%**	**-**	**50.3**	**0.34**	**0.34**	**4.6**	**40.7**	**0.34**	**2.4**	**-**	**-**	**-**	**-**	**98.98**
				F. c.	-	0.95	0.01	0.01	0.08	0.86	0.01	0.09	-	-	-	-	ΣK=2
35	75, 54	ILM+BORN+CHC +PdCu	ILM	**Wt.%**	**-**	**51.6**	**5.2**	**0.46**	**2.5**	**42.4**	**0.44**	**2.0**	**-**	**-**	**-**	**-**	**99.4**
				F. c.	-	0.97	0.23	0.01	0.05	0.89	0.01	0.08	-		-	-	ΣK=2
36	125-1, 8	TIMT+BORN+ CHC+PdCu	TIMT	**Wt.%**	**-**	**5.2**	**5.2**	**1.8**	**50.2**	**35.1**	**0.21**	**0.68**	**-**	**-**	**-**	**-**	**98.39**
				F. c.	-	0.15	0.23	0.05	1.42	1.10	0.01	0.04	-	-	-	-	ΣK=3
37	75, 19	TIMT+CHC+ BORN+PdCu	TIMT	**Wt.%**	**-**	**12.3**	**5.3**	**1.9**	**36.9**	**41.8**	**-**	**0.94**	**-**	**-**	**-**	**-**	**99.14**
				F. c.	-	0.34	0.23	0.06	1.03	1.29	-	0.05	-	-	-	-	ΣK=3
38	75, w.n.	TIMT+CHC+BORN	TIMT	**Wt.%**	**-**	**13.8**	**4.7**	**1.6**	**36.6**	**43.8**	**0.36**	**0.53**	**-**	**-**	**-**	**-**	**101.39**
				F. c.	-	0.38	0.20	0.05	1.00	1.33	0.01	0.03	-	-	-	-	ΣK=3
39	125-1, w.n.	MT+BORN+CHC+ PdCu	MT	**Wt.%**	**-**	**0.46**	**-**	**-**	**67.5**	**30.4**	**-**	**0.43**	**-**	**-**	**-**	**-**	**98.79**
				F. c.	-	0.01	-	-	1.97	0.99	-	0.03	-	-	-	-	ΣK=3
40	75, 50	MT+BORN+PdCu	MT	**Wt.%**	**-**	**1.1**	**1.7**	**-**	**65.1**	**32.5**	**-**	**-**	**-**	**-**	**-**	**-**	**100.3**
				F. c.	-	0.03	0.08	-	1.86	1.04	-	-	-	-	-	-	ΣK=3
41	75, 47	MT+CHL+BORN+ PdCu	MT	**Wt.%**	**-**	**1.5**	**0.87**	**-**	**72.4**	**25.5**	**-**	**-**	**-**	**-**	**-**	**-**	**100.27**
				F. c.	-	0.04	0.04	-	2.04	0.80	-	-	-	-	-	-	ΣK=3
42	75, w.n.	MT+CHC+BORN	MT	**Wt.%**	**-**	**0.55**	**-**	**-**	**67.4**	**31.3**	**-**	**-**	**-**	**-**	**-**	**-**	**99.25**
				F. c.	-	0.02	-	-	1.97	1.02	-	-	-	-	-	-	ΣK=3
43	75, 71	MT+CHC+ BORN+PdCu	MT	**Wt.%**	**-**	**1.5**	**1.3**	**4.8**	**59.7**	**32.3**	**-**	**0.38**	**-**	**-**	**-**	**-**	**99.78**
				F. c.	-	0.04	0.06	0.15	1.71	1.02	-	0.02	-	-	-	-	ΣK=3

Table 1 continued. *Chemical composition and formulas of silicates and oxides of oxide-rich tholeiitic gabbros (sample 90-24, 1057)*

An.	Object	Association of minerals	Mineral		SiO_2	TiO_2	Al_2O_3	V_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	Na_2O	K_2O	Cl	Total
44	75, 49	HB+BORN+DGN+ PdCu	HB	**Wt.%**	**43.0**	**2.4**	**11.9**	**0.35**	**-**	**16.2**	**-**	**12.3**	**10.5**	**0.41**	**0.88**	**-**	**87.94**
				F. c.	6.36	0.28	2.08	0.04	-	2.00	-	2.72	1.67	0.12	0.17	-	O=23
45	125-1, 9	EP+PL+(Pd,Pt)Cu+ BORN+CHC+(Pd,Pt)Cu	EP	**Wt.%**	**38.6**	**-**	**24.3**	**-**	**12.7**	**-**	**-**	**-**	**22.9**	**-**	**-**	**-**	**98.5**
				F. c.	3.03	-	2.25	-	22.9-	-	-	-	1.93	-	-	-	O=25
46	125-1, glbl. 12a	CHL+CT+CHC	CHL	**Wt.%**	**33.0**	**0.32**	**11.0**	**-**	**-**	**22.7**	**-**	**21.0**	**-**	**-**	**-**	**-**	**88.02**
				F. c.	1.70	0.01	0.67	-	-	0.97	-	1.61	-	-	-	-	O=7
47	75, 47	CHL+MT+BORN+ PdCu	CHL	**Wt.%**	**31.0**	**1.7**	**18.6**	**-**	**-**	**30.3**	**-**	**6.4**	**-**	**-**	**-**	**-**	**88.0**
				F. c.	1.64	0.07	1.16	-	-	1.34	-	0.50	-	-	-	-	O=7

P. s. – polished section, f. c. – formula coefficient; FeO and Fe_2O_3 – are colculated from tipical formula of minerals, ΣK – sum of kations.

Table 2. *Chemical composition and formulas of sulphides in PGM-bearing globules of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain	Mineral		Cu	Fe	Ni	Co	Zn	S	Total
1	45-1, 4	BORN+Pd_3Cu+Pd(Cu,Sn)	BORN	**Wt.%**	**63.6**	**10.8**	**-**	-	-	**25.4**	**99.8**
				F. c.	5.03	0.97	-	-	-	4.00	10
2	45-1, 12	CHC+(Pd,Au)Cu	CHC	**Wt.%**	**78.9**	**0.6**	**-**	**-**	**-**	**20.4**	**99.4**
				F. c.	1.97	0.02	-	-	-	1.01	3
3	45-1, 14	BORN+PdCu+(Pd,Cu,Sn)	BORN	**Wt.%**	**63.6**	**11.3**	**-**	**-**	**-**	**25.1**	**99.7**
				F. c.	5.03	1.02	-	-	-	3.95	10
4	45-1, 15	CHC+BORN+PdCu	CHC	**Wt.%**	**78.0**	**0.9**	**-**	**-**	**-**	**20.0**	**99.2**
				F. c.	1.97	0.03	-	-	-	1.00	3
5	45-1, 15	CHC+BORN+PdCu	BORN	**Wt.%**	**61.9**	**11.7**	**-**	**-**	**-**	**26.2**	**98.4**
				F. c.	4.87	1.05	-	-	-	4.08	10
6	45-1, 16	CHC+BORN+PdCu	CHC	**Wt.%**	**77.1**	**1.4**	**-**	**-**	**-**	**19.9**	**98.4**
				F. c.	1.96	0.04	-	-	-	2.00	3
7	45-1, 16	CHC+BORN+PdCu	BORN	**Wt.%**	**63.0**	**11.0**	**-**	**-**	**-**	**25.5**	**99.5**
				F. c.	5.00	0.99	-	-	-	4.01	10
8	45-1, 17	BORN+PdCu+(Pd,Cu,Sn) +MT	BORN	**Wt.%**	**60.4**	**11.9**	**-**	**-**	**-**	**25.4**	**98.7**
				F. c.	4.86	1.09	-	-	-	4.05	10
9	45-1, 20	CHC+BORN+PdCu	CHC	**Wt.%**	**77.4**	**1.4**	**-**	**-**	**-**	**20.7**	**99.5**
				F. c.	1.93	0.04	-	-	-	1.03	3
10	45-1, 20	CHC+BORN+PdCu	BORN	**Wt.%**	**61.5**	**11.0**	**-**	**-**	**-**	**26.1**	**98.6**
				F. c.	4.89	1.0	-	-	-	4.11	10
11	45-1, 22	BORN+PdCu	BORN	**Wt.%**	**62.0**	**11.4**	**-**	**-**	**-**	**25.7**	**99.1**
				F. c.	4.92	1.03	-	-	-	4.05	10
12	45-1, 23	BORN+PdCu	BORN	**Wt.%**	**62.4**	**11.0**	**-**	**-**	**-**	**25.5**	**98.9**
				F. c.	4.97	1.00	-	-	-	4.03	10
13	45-1, 26	BORN+CHC+PdCu+ VSL	BORN	**Wt.%**	**62.5**	**11.7**	**-**	**-**	**-**	**26.3**	**100.5**
				F. c.	4.89	1.04	-	-	-	4.07	10
14	45-1, 26	BORN+CHC+PdCu+ VSL	CHC	**Wt.%**	**76.9**	**1.4**	**-**	**-**	**-**	**19.2**	**97.5**
				F. c.	1.98	0.04	-	-	-	0.98	3

Table 2 continued. *Chemical composition and formulas of sulphides in PGM-bearing globules of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain	Mineral		Cu	Fe	Ni	Co	Zn	S	Total
15	45-1, 30	BORN+PdCu+MT	BORN	**Wt.%**	**60.8**	**11.2**	**-**	**-**	**-**	**26.0**	**98.0**
				F. c.	4.86	1.02	-	-	-	4.12	10.0
16	45-1, 35	BORN+PdCu	BORN	**Wt.%**	**62.8**	**11.4**	**-**	**-**	**-**	**25.7**	**99.9**
				F. c.	4.95	1.03	-	-	-	4.02	10
17	45-1, 39	CHC+BORN+PdCu+MT	CHC	**Wt.%**	**77.7**	**1.4**	**-**	**-**	**-**	**20.0**	**99.1**
				F. c.	1.96	0.04	-	-	-	1.00	3
18	45-1, 39	CHC+BORN+PdCu+MT	BORN	**Wt.%**	**62.9**	**11.8**	**-**	**-**	**-**	**25.2**	**99.9**
				F. c.	4.97	1.07	-	-	-	3.96	10
19	45-1, 43	CHC+PdCu	CHC	**Wt.%**	**78.0**	**1.0**	**-**	**-**	**-**	**20.3**	**99.3**
				F. c.	1.96	0.03	-	-	-	1.01	3
20	45-1, 49	CHC+BORN+PdCu+ILM	CHC	**Wt.%**	**76.2**	**1.9**	**-**	**-**	**-**	**20.5**	**98.6**
				F. c.	1.92	0.06	-	-	-	1.02	3
21	45-1, 61	BORN+PdCu+CHC	BORN	**Wt.%**	**77.2**	**1.7**	**-**	**-**	**-**	**20.9**	**99.8**
				F. c.	1.92	0.05	-	-	-	1.03	10
22	45-1, 66	CHC+BORN+PdCu+CHL	CHC	**Wt.%**	**78.2**	**1.2**	**-**	**-**	**-**	**19.9**	**99.3**
				F. c.	1.97	0.03	-	-	-	2.00	3
23	45-1, 82	CHC+$PdCu_3$	CHC	**Wt.%**	**78.4**	**0.6**	**-**	**-**	**-**	**20.1**	**99.1**
				F. c.	1.98	0.02	-	-	-	1.00	1.00
24	45-1, 87	CHC+PdCu+Pd(Cu,Sn)	CHC	**Wt.%**	**79.5**	**0.7**	**-**	**-**	**-**	**19.2**	**99.4**
				F. c.	2.01	0.02	-	-	-	0.97	3
25	45-1, 97	CHC+BORN+(Pd,Au)Cu	CHC	**Wt.%**	**78.8**	**0.6**	**-**	**-**	**-**	**19.7**	**99.1**
				F. c.	2.00	0.01	-	-	-	0.99	3
26	45-1, 133	CHC+(Cu,Pd)	CHC	**Wt.%**	**78.6**	**0.9**	**-**	**-**	**-**	**19.6**	**99.1**
				F. c.	1.99	0.03	-	-	-	0.98	3
27	45-1, 136	CHC+PdCu	CHC	**Wt.%**	**78.0**	**0.9**	**-**	**-**	**-**	**20.0**	**98.9**
				F. c.	1.97	0.03	-	-	-	1.00	3
28	45-1, 140	CHC+PdCu	CHC	**Wt.%**	**78.4**	**1.2**	**-**	**-**	**-**	**19.2**	**98.8**
				F. c.	1.99	0.04	-	-	-	0.97	3

Table 2 continued. *Chemical composition and formulas of sulphides in PGM-bearing globules of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain	Mineral		Cu	Fe	Ni	Co	Zn	S	Total
29	45-1, 144	CHC+BORN+PdCu+ $PdCu_3$	CHC	**Wt.%**	**76.5**	**2.1**	**-**	**-**	**-**	**20.5**	**99.1**
				F. c.	1.92	0.06	-	-	-	1.02	3
30	45-1, 146	CHC+PdCu	CHC	**Wt.%**	**77.2**	**0.5**	**-**	**-**	**-**	**20.6**	**98.3**
				F. c.	1.95	0.01	-	-	-	1.04	3
31	45-1, 156	BORN+PdCu+MT	BORN	**Wt.%**	**62.0**	**12.4**	**-**	**-**	**-**	**24.6**	**99.0**
				F. c.	4.96	-	-	-	-	3.91	10
32	45-1, 169	CHC+(Pd,Au)Cu	CHC	**Wt.%**	**77.1**	**0.75**	**-**	**-**	**-**	**20.5**	**98.35**
				F. c.	1.95	0.02	-	-	-	1.03	3
33	45-1, 170	CHC+BORN+ (Pd,Au)Cu	CHC	**Wt.%**	**76.6**	**2.3**	**-**	**-**	**-**	**20.6**	**99.5**
				F. c.	1.91	0.07	-	-	-	1.02	3
34	45-1, 170	CHC+BORN+ (Pd,Au)Cu	BORN	**Wt.%**	**63.4**	**10.8**	**-**	**-**	**-**	**25.6**	**99.8**
				F. c.	5.02	0.97	-	-	-	4.01	10
35	45-1, 172	CHC+KTH+$PdAuCu_2$	CHC	**Wt.%**	**80.2**	**0.46**	**-**	**-**	**-**	**19.1**	**99.76**
				F. c.	2.03	0.01	-	-	-	0.96	3
36	45-1, 176	CHC+BORN+PdCu	CHC	**Wt.%**	**78.2**	**1.5**	**-**	**-**	**-**	**19.7**	**99.4**
				F. c.	1.98	0.04	-	-	-	0.98	3
37	45-1, 176	CHC+BORN+PdCu	BORN	**Wt.%**	**62.7**	**11.3**	**-**	**-**	**-**	**25.4**	**99.4**
				F. c.	4.98	1.02	-	-	-	4.00	10
38	45-1, 181	CHC+BORN+(Pd,Au)Cu	CHC	**Wt.%**	**78.3**	**0.84**	**-**	**-**	**-**	**20.2**	**99.34**
				F. c.	1.97	0.03	-	-	-	1.00	3
40	45-2, 1	CHC+BORN+(Pd,Au)Cu+ $PdCu_3$	CHC	**Wt.%**	**79.2**	**0.90**		**-**		**19.8**	**99.9**
				F. c.	1.99	0.03		-		0.98	3
41	45-2, 39	CHC+PdCu+ILM	CHC	**Wt.%**	**76.1**	**2.4**	**-**	**-**	**-**	**20.6**	**99.1**
				F. c.	1.91	0.07	-	-	-	1.02	3
42	75, 1	CHC+BORN+PdCu	CHC	**Wt.%**	**79.1**	**0.85**	**-**	**-**	**-**	**19.3**	**99.25**
				F. c.	2.00	0.02	-	-	-	0.98	3
43	75, 1	CHC+BORN+PdCu	BORN	**Wt.%**	**62.3**	**11.7**	**-**	**-**	**-**	**25.1**	**99.1**
				F. c.	4.96	1.06	-	-	-	3.97	10

Table 2 continued. *Chemical composition and formulas of sulphides in PGM-bearing globules of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain	Mineral		Cu	Fe	Ni	Co	Zn	S	Total
44	75, 32	CHC+BORN+PdCu+MT	CHC	**Wt.%**	**76.6**	**1.9**	**-**	**-**	**-**	**20.5**	**99.0**
				F. c.	1.92	0.06	-	-	-	1.02	3
45	75, 70	CHC+PdCu	CHC	**Wt.%**	**77.9**	**0.63**	**-**	**-**	**-**	**19.8**	**98.33**
				F. c.	1.98	0.02	-	-	-	1.00	3
An.	Grain	Association of minerals in the grain	Mineral		Cu	Fe	Ni	Co	Zn	S	Total
46	125-1, glb 12a	CHC+CT+CHL	CHC	**Wt.%**	**78.3**	**-**	**-**	**-**	**-**	**20.0**	**98.3**
				F. c.	1.99	-	-	-	-	1.01	3
47	125-1, glb. 3	CHC+BORN	CHC	**Wt.%**	**78.8**	**0.5**	**-**	**-**	**-**	**20.6**	**99.9**
				F. c.	1.97	0.01	-	-	-	1.02	3
48	125-1, 12	CHC+BORN+$PdCu_3$	CHC	**Wt.%**	**78.1**	**0.46**	**-**	**-**	**-**	**20.7**	**99.26**
				F. c.	1.96	0.01	-	-	-	1.03	3
49	125-1, 12	CHC+BORN+$PdCu_3$	BORN	**Wt.%**	**62.2**	**11.2**	**-**	**-**	**-**	**25.3**	**98.7**
				F. c.	4.97	1.02	-	-	-	4.01	10
50	125-2, 4	CHC+BORN+PdCu+BT	CHC	**Wt.%**	**78.9**	**-**	**-**	**-**	**-**	**19.9**	**98.8**
				F. c.	2.00	-	-	-	-	1.00	3
51	125-2, 4	CHC+BORN+PdCu+BT	BORN	**Wt.%**	**63.1**	**11.2**	**-**	**-**	**-**	**25.5**	**99.8**
				F. c.	4.99	1.01	-	-	-	4.00	10
52	45-1, 33	DGN+PdCu	DGN	**Wt.%**	**77.3**	**1.0**	**-**	**-**	**-**	**20.8**	**99.1**
				F. c.	9.04	0.13	-	-	-	4.83	14
53	45-1, 51	DGN+PdCu	DGN	**Wt.%**	**76.4**	**1.4**	**-**	**-**	**-**	**21.2**	**99.0**
				F. c.	8.91	0.19	-	-	-	4.90	14
54	45-1, 68	DGN+$PdCu_3$	DGN	**Wt.%**	**77.2**	**0.6**	**-**	**-**	**-**	**21.3**	**99.1**
				F. c.	8.99	0.08	-	-	-	4.93	14
55	45-1, 141	DGN+(Pd,Cu)	DGN	**Wt.%**	**77.9**	**0.6**	**-**	**-**	**-**	**20.9**	**99.4**
				F. c.	9.09	0.08	-	-	-	4.83	14
56	45-1, 148	DGN+PdCu	DGN	**Wt.%**	**77.1**	**0.6**		**-**		**21.1**	**98.8**
				F. c.	9.02	0.08		-		4.89	14
57	45-1, 166	DGN+BORN+PdCu	DGN	**Wt.%**	**76.3**	**1.5**	**-**	**-**	**-**	**21.0**	**98.8**
				F. c.	8.93	0.19	-	-	-	4.88	14

Table 2 continued. *Chemical composition and formulas of sulphides in PGM-bearing globules of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain	Mineral		Cu	Fe	Ni	Co	Zn	S	Total
58	45-1, 166	DGN+BORN+PdCu	DGN	**Wt.%**	**77.0**	**0.58**	**-**	**-**	**-**	**21.0**	**98.58**
				F. c.	9.04	0.08	-	-	-	4.88	14
59	75, 49	DGN+BORN+PdCu+HB	DGN	**Wt.%**	**77.6**	**0.94**	**-**	**-**	**-**	**21.7**	**100.24**
				F. c.	8.94	0.12	-	-	-	4.94	14
60	75, 49	DGN+BORN+PdCu+HB	BORN	**Wt.%**	**62.5**	**10.4**	**-**	**-**	**-**	**25.4**	**98.3**
				F. c.	5.01	0.95	-	-	-	4.04	10
61	75, 54	DGN+BORN+PdCu+ILM	DGN	**Wt.%**	**74.8**	**2.4**	**-**	**-**	**-**	**21.4**	**98.6**
				F. c.	8.73	0.32	-	-	-	4.95	3
An.	Grain	Association of minerals in the grain	Mineral		Cu	Fe	Ni	Co	Zn	S	Total
62	75, 82	DGN+PdCu	DGN	**Wt.%**	**76.5**	**1.1**	**-**	**-**	**-**	**21.6**	**99.2**
				F. c.	8.89	0.14	-	-	-	4.97	14
63	125-1, glb. 11	DGN+BORN	DGN	**Wt.%**	**78.0**	**1.5**	**-**	**-**	**-**	**21.4**	**100.9**
				F. c.	8.94	0.20	-	-	-	4.86	14
64	75, 75	CP+BORN+PdCu	CP	**Wt.%**	**33.8**	**30.5**	**-**	**-**	**-**	**35.6**	**99.9**
				F. c.	0.97	1.00	-	-	-	2.03	4
65	45-1, 81	PN-(Co)+BORN+PdCu +ZV	PN-(Co)	**Wt.%**	**-**	**12.6**	**29.4**	**24.7**	**-**	**32.6**	**99.3**
				F. c.	-	1.77	3.94	3.29	-	8.00	17
66	75-26	CHC+COPN+PdCu	COPN	**Wt.%**	**-**	**9.5**	**19.4**	**38.4**	**-**	**32.8**	**100.1**
				F. c.	-	1.33	2.58	5.09	-	8.00	17
67	75-26	CHC+COPN+PdCu	CHC	**Wt.%**	**78.6**	**0.47**	**-**	**-**	**-**	**20.2**	**99.27**
				F. c.	1.98	0.02	-	-	-	1.00	3
68	45-1, 45	SPH+BORN+CHC+PdCu	SPH	**Wt.%**	**0.7**	**1.3**	**-**	**-**	**64.7**	**32.8**	**99.5**
				F. c.	0.01	0.02	-	-	0.97	1.00	2

Table 3. *PGE- and Au-minerals of the heavy concentrates (sample 90-24, 1057)*

N	Mineral	General formula	Number of grains	Grain size, μm			Vol.%
				min	max	average	
1	Unnamed PdCu	(Pd,Au,Pt)(Pd,Fe,Zn,Sn,Te,Pb)	354	2	75	22	94
2	Unnamed $PdCu_3$	$(Pd,Au,Pt)(Cu,Fe,Pb)_3$	12(7*)	5	50	16	3
3	Alloy (Pd,Cu,Sn)	$(Pd,Cu)_8As_3$	3(12*)	3	22	11	1
4	Minerals of Au (unnamed $PdAuCu_2$ bogdanovite)	$PdAuCu_2$ $(Au,Pd)_3Cu$	5(4*)	9	25	18	1
5	Keithconnite	(Pd,Cu,Fe)3(Te,Sn,Pb)	(11*)	3	11	8	0.3
6	Vasilite	$(Pd,Cu,Fe)_{16}(S,Te)_7$	(5*)	4	9	7	0.1
7	Zvyagintsevite	Pd_3Pb	(3*)	2	8	3	<0.1
8	Tetraferroplatinum	(Pt,Pd)(Fe,Cu)	(2*)	3	7	4	<0.1
9	Hongshiite	(Pt,Pd)(Cu,Fe)	(1*)	-	-	4	<0.1
10	Unnamed $(Pt,Pd)Cu_3$	$(Pt,Pd)(Cu,Fe)_3$	(1*)	-	-	5	<1
	Total		373	2	75	22	100

*As inclusions in grains of other precious metal minerals.

Table 4. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
1	P.s.,1	PdCu+OPX+CPX+CP	**Wt.%**	**58.1**	**1.1**	**4.7**	**28.1**	**6.0**	**1.5**	**-**	**-**	**-**	**99.5**
			F. c.	0.95	0.01	0.04	0.77	0.19	0.04	-	-	-	2
2	P.s.,2	(Pd,Pt)Cu+BORN+ILM+CPX+OPX	**Wt.%**	**57.4**	**6.3**	**-**	**29.3**	**4.5**	**2.4**	**-**	**-**	**-**	**99.9**
			F. c.	0.94	0.06	-	0.80	0.14	0.06	-	-	-	2
3	P.s.,3	PdCu+CPX+OPX	**Wt.%**	**61.1**	**1.7**	**-**	**31.6**	**4.0**	**0.56**	**-**	**-**	**-**	**98.96**
			F. c.	0.99	0.02	-	0.86	0.12	0.01	-	-	-	2
4	P.s.,4	PdCu+BORN+TIMT+ILM	**Wt.%**	**61.1**	**1.8**	**1.9**	**30.6**	**3.4**	**0.48**	**-**	**-**	**-**	**99.28**
			F. c.	1.00	0.02	0.02	0.84	0.11	0.01	-	-	-	2
5	P.s.,5	PdCu+BORN+CHC+CPX+OPX	**Wt.%**	**62.1**	**-**	**-**	**29.5**	**5.4**	**1.6**	**-**	**-**	**-**	**98.6**
			F. c.	1.00	-	-	0.79	0.17	0.04	-	-	-	2
6	P.s.,6	PdCu+KTH+ILM	**Wt.%**	**62.0**	**1.1**	**-**	**28.5**	**7.3**	**1.3**	**-**	**-**	**-**	**100.2**
			F. c.	0.98	0.01	-	0.76	0.22	0.03	-	-	-	2
7	P.s.,7	PdCu+BORN+CHC+PL	**Wt.%**	**60.8**	**-**	**1.7**	**30.4**	**3.3**	**3.3**	**-**	**-**	**-**	**99.5**
			F. c.	0.97	-	0.02	0.82	0.10	0.09	-	-	-	2
8	P.s.,8	PdCu+BORN+CPX	**Wt.%**	**63.4**	**-**	**-**	**28.9**	**5.3**	**1.9**	**-**	**-**	**-**	**99.5**
			F. c.	1.02	-	-	0.77	0.16	0.05	-	-	-	2
9	45-1, 1	PdCu+BORN	**Wt.%**	**63.9**	**-**	**-**	**31.5**	**3.8**	**0.7**	**-**	**-**	**-**	**99.9**
			F. c.	1.02	-	-	0.84	0.12	0.02	-	-	-	2
10	45-1, 2	PdCu	**Wt.%**	**60.4**	**1.3**	**0.9**	**33.1**	**3.4**	**-**	**-**	**-**	**-**	**99.1**
			F. c.	0.98	0.01	0.01	0.90	0.10	-	-	-	-	2
11	45-1, 3	PdCu+BORN+CHC	**Wt.%**	**57.1**	**4.3**	**-**	**29.7**	**2.2**	**1.8**	**-**	**-**	**3.2**	**98.3**
			F. c.	0.97	0.04	-	0.84	0.07	0.05	-	-	0.03	2
12	45-1, 4	Pd(Cu,Sn)+$PdCu_3$+BORN+CHC	**Wt.%**	**58.8**	**-**	**-**	**24.3**	**-**	**-**	**15.1**	**-**	**-**	**98.2**
			F. c.	1.04	-	-	0.72	-	-	0.24	-	-	2
13	45-1, 5	PdCu+BORN	**Wt.%**	**63.6**	**-**	**-**	**29.3**	**5.0**	**2.6**	**-**	**-**	**-**	**100.5**
			F. c.	1.00	-	-	0.78	0.15	0.07	-	-	-	2
14	45-1, 6	PdCu+CHC+BORN	**Wt.%**	**61.7**	**-**	**-**	**32.1**	**2.6**	**2.9**	**-**	**-**	**1.4**	**100.7**
			F. c.	0.98	-	-	0.86	0.08	0.07	-	-	0.01	2
15	45-1, 7	PdCu+CHC+BORN	**Wt.%**	**57.4**	**4.3**	**-**	**33.5**	**4.1**	**0.9**	**-**	**-**	**1.3**	**101.5**
			F. c.	0.91	0.04	-	0.89	0.13	0.02	-	-	0.01	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
16	45-1, 8	PdCu+(Pd,Cu,Sn)	**Wt.%**	**59.6**	**-**	**-**	**30.3**	**2.9**	**1.1**	**3.8**	**-**	**1.3**	**99.0**
			F. c.	0.98	-	-	0.83	0.09	0.03	0.06	-	0.01	2
17	45-1, 10	PdCu+CHC +BORN +MT	**Wt.%**	**55.3**	**3.6**	**1.0**	**33.3**	**5.0**	**-**	**-**	**-**	**-**	**98.2**
			F. c.	0.90	0.03	0.02	0.90	0.15	-	-	-	-	2
18	45-1, 11	PdCu +BORN+CHC	**Wt.%**	**57.7**	**4.8**	**-**	**30.0**	**5.9**	**0.5**	**-**	**-**	**-**	**98.9**
			F. c.	0.94	0.04	-	0.82	0.18	0.02	-	-	-	2
19	45-1, 12	(Pd,Au)Cu+CHC	**Wt.%**	**47.4**	**-**	**13.0**	**38.2**	**1.3**	**0.6**	**-**	**-**	**-**	**100.5**
			F. c.	0.78	-	0.12	1.05	0.04	0.01	-	-	-	2
20	45-1, 13	(Pd,Pt)Cu+CHC+BORN+CPX	**Wt.%**	**51.6**	**8.4**	**2.7**	**29.2**	**6.2**	**0.6**	**-**	**-**	**-**	**98.7**
			F. c.	0.87	0.08	0.02	0.82	0.20	0.01	-	-	-	2
21	45-1, 14	PdCu+(Pd,Cu,Sn)+BORN	**Wt.%**	**56.7**	**3.5**	**-**	**28.7**	**3.1**	**2.0**	**3.0**	**-**	**2.2**	**99.2**
			F. c.	0.95	0.03	-	0.80	0.10	0.06	0.04	-	0.02	2
22	45-1, 15	PdCu+BORN+CHC	**Wt.%**	**52.1**	**1.7**	**-**	**43.5**	**2.1**	**-**	**-**	**-**	**-**	**99.4**
			F. c.	0.80	0.02	-	1.12	0.06	-	-	-	-	2
23	45-1, 16	(Pd,Au()Cu+CHC +BORN	**Wt.%**	**56.1**	**-**	**8.4**	**30.6**	**2.4**	**2.0**	**-**	**-**	**-**	**99.5**
			F. c.	0.94	-	0.07	0.88	0.07	0.05	-	-	-	2
24	45-1, 17	(Pd,Cu,Sn)+BORN	**Wt.%**	**58.4**	**1.7**	**1.8**	**29.3**	**2.8**	**1.0**	**3.1**	**-**	**1.6**	**99.7**
			F. c.	0.97	0.02	0.02	0.82	0.09	0.03	0.04	-	0.01	2
25	45-1, 18	Pd(Cu,Sn)+(Pd,Cu,Sn)+BORN+MT	**Wt.%**	**58.7**	**1.6**	**1.3**	**30.3**	**1.6**	**0.65**	**5.2**	**-**	**-**	**99.35**
			F. c.	0.98	0.01	0.01	0.85	0.05	0.02	0.08	-	-	2
28	45-1, 20	PdCu+CHC+BORN	**Wt.%**	**60.4**	**1.7**	**-**	**30.2**	**2.9**	**0.9**	**1.4**	**-**	**2.4**	**99.9**
			F. c.	0.99	0.02	-	0.83	0.09	0.03	0.02	-	0.02	2
29	45-1, 21	PdCu+CHC+BORN+MT	**Wt.%**	**54.2**	**3.8**	**3.7**	**29.3**	**1.4**	**0.8**	**2.3**	**-**	**3.5**	**99.0**
			F. c.	0.94	0.04	0.03	0.85	0.05	0.02	0.04	-	0.03	2
30	45-1, 22	PdCu +BORN	**Wt.%**	**61.9**	**-**	**-**	**30.4**	**6.6**	**-**	**-**	**-**	**-**	**98.9**
			F. c.	0.99	-	-	0.81	0.20	-	-	-	-	2
31	45-1, 23	(Pd,Pt)Cu +BORN	**Wt.%**	**55.5**	**8.7**	**-**	**28.1**	**5.4**	**1.9**	**-**	**-**	**-**	**99.6**
			F. c.	0.92	0.08	-	0.78	0.17	0.05	-	-	-	2
32	45-1, 24	PdCu	**Wt.%**	**62.3**	**-**	**-**	**30.2**	**5.8**	**1.4**	**-**	**-**	**-**	**99.7**
			F. c.	0.99	-	-	0.80	0.17	0.04	-	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
33	45-1, 25	PdCu+(Pd,Cu,Sn)	**Wt.%**	**58.3**	**1.2**	**2.2**	**29.6**	**2.2**	**1.1**	**3.2**	**-**	**1.9**	**99.7**
			F. c.	0.97	0.01	0.02	0.83	0.07	0.03	0.05	-	0.02	2
34	45-1, 27	PdCu+BORN+CHC	**Wt.%**	**62.2**	**-**	**-**	**30.7**	**5.6**	**1.8**	**-**	**-**	**-**	**100.3**
			F. c.	0.98	-	-	0.81	0.17	0.04	-	-	-	2
35	45-1, 28	PdCu+BORN+CHC	**Wt.%**	**61.2**	**1.7**	**-**	**30.7**	**3.8**	**1.2**	**-**	**-**	**2.3**	**100.9**
			F. c.	0.99	0.01	-	0.83	0.12	0.03	-	-	0.02	2
36	45-1, 29	PdCu+(Pd,Cu,Sn)+BORN	**Wt.%**	**59.4**	**-**	**-**	**29.2**	**1.3**	**1.0**	**4.5**	**-**	**3.3**	**98.7**
			F. c.	1.01	-	-	0.83	0.04	0.03	0.07	-	0.03	2
37	45-1, 30	PdCu+BORN+MT	**Wt.%**	**61.8**	**-**	**-**	**28.5**	**3.9**	**1.0**	**3.1**	**-**	**1.4**	**99.1**
			F. c.	1.01	-	-	0.78	0.12	0.03	0.05	-	0.01	1
38	45-1, 31	PdCu	**Wt.%**	**62.2**	**-**	**-**	**30.0**	**3.5**	**2.0**	**-**	**-**	**-**	**98.6**
			F. c.	1.00	-	-	0.84	0.11	0.05	-	-	-	2
39	45-1, 32	PdCu	**Wt.%**	**61.7**	**-**	**-**	**28.3**	**6.3**	**2.3**	**-**	**-**	**-**	**98.6**
			F. c.	0.99	-	-	0.76	0.19	0.06	-	-	-	2
40	45-1, 33	PdCu(zon.1)+DGN	**Wt.%**	**53.8**	**-**	**-**	**42.9**	**2.0**	**-**	**-**	**-**	**-**	**98.7**
			F. c.	0.83	-	-	1.11	0.06	-	-	-	-	2
41	45-1, 33	PdCu(zon.2)+DGN	**Wt.%**	**58.9**	**-**	**-**	**35.2**	**1.0**	**0.7**	**3.6**	**-**	**-**	**99.4**
			F. c.	0.95	-	-	0.95	0.03	0.02	0.05	-	-	2
42	45-1, 34	PdCu+KTH+VSL+MT+CP	**Wt.%**	**55.6**	**4.0**	**4.8**	**29.8**	**3.5**	**-**	**-**	**0.8**	**1.4**	**99.9**
			F. c.	0.94	0.04	0.04	0.85	0.11	-	-	0.01	0.01	2
43	45-1, 35	PdCu+BORN	**Wt.%**	**62.6**	**-**	**-**	**29.7**	**3.9**	**2.1**	**0.9**	**-**	**-**	**99.2**
			F. c.	1.01	-	-	0.80	0.12	0.06	0.01	-	-	2
44	45-1, 36	PdCu+BORN	**Wt.%**	**61.5**	**-**	**-**	**29.5**	**4.4**	**3.0**	**-**	**-**	**-**	**98.4**
			F. c.	0.99	-	-	0.80	0.13	0.08	-	-	-	2
45	45-1, 37	PdCu+BORN	**Wt.%**	**60.6**	**1.0**	**-**	**30.6**	**5.5**	**1.1**	**-**	**-**	**-**	**98.8**
			F. c.	0.97	0.01	-	0.82	0.17	0.03	-	-	-	2
46	45-1, 38	PdCu+BORN+CHL	**Wt.%**	**62.9**	**-**	**-**	**29.4**	**3.0**	**2.0**	**1.0**	**-**	**1.2**	**99.5**
			F. c.	1.02	-	-	0.81	0.10	0.05	0.01	-	0.01	2
47	45-1, 39	PdCu+BORN+CHC	**Wt.%**	**58.8**	**2.9**	**-**	**31.1**	**5.8**	**-**	**-**	**-**	**-**	**98.6**
			F. c.	0.95	0.03	-	0.84	0.18	-	-	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
48	45-1, 40	PdCu+CHC	**Wt.%**	**61.9**	**-**	**-**	**30.4**	**4.2**	**2.1**	**-**	**-**	**-**	**98.6**
			F. c.	1.00	-	-	0.82	0.13	0.05	-	-	-	2
49	45-1, 41	(Pd,Pt)Cu+BORN+CHC	**Wt.%**	**57.4**	**5.6**	**-**	**29.7**	**4.9**	**1.0**	**-**	**-**	**-**	**98.6**
			F. c.	0.97	0.05	-	0.82	0.15	0.03	-	-	-	2
50	45-1, 42	PdCu	**Wt.%**	**59.8**	**-**	**3.0**	**29.5**	**3.6**	**2.8**	**-**	**0.8**	**-**	**99.5**
			F. c.	0.97	-	0.03	0.81	0.11	0.07	-	0.01	-	2
51	45-1, 44	PdCu+BORN+CHC+OPX	**Wt.%**	**60.7**	**1.8**	**-**	**30.3**	**5.9**	**0.5**	**-**	**-**	**-**	**99.2**
			F. c.	0.97	0.02	-	0.82	0.18	0.01	-	-	-	2
52	45-1, 45	PdCu+ SPH+BORN+CHC	**Wt.%**	**61.7**	**-**	**1.7**	**29.6**	**3.9**	**2.3**	**-**	**-**	**-**	**99.2**
			F. c.	1.00	-	0.02	0.80	0.12	0.06	-	-	-	2
53	45-1, 46	PdCu+BORN	**Wt.%**	**57.4**	**-**	**4.0**	**31.2**	**4.2**	**-**	**-**	**1.5**	**-**	**99.0**
			F. c.	0.95	-	0.04	0.86	0.13	-	-	0.02	-	4
54	45-1, 47	PdCu+BORN	**Wt.%**	**62.4**	**-**	**-**	**27.7**	**6.0**	**1.9**	**0.8**	**-**	**-**	**98.8**
			F. c.	1.01	-	-	0.75	0.18	0.05	0.01	-	-	2
55	45-1, 48	PdCu+BORN	**Wt.%**	**62.4**	**-**	**-**	**30.1**	**5.8**	**1.1**	**-**	**-**	**-**	**99.4**
			F. c.	0.99	-	-	0.80	0.18	0.03	-	-	-	2
56	45-1, 49	PdCu+CHC+BORN+ILM	**Wt.%**	**60.9**	**-**	**1.5**	**31.1**	**1.9**	**2.6**	**1.2**	**-**	**-**	**99.2**
			F. c.	0.99	-	0.01	0.85	0.06	0.07	0.02	-	-	2
57	45-1, 50	(Pd,Au)Cu	**Wt.%**	**55.8**	**1.0**	**6.7**	**29.3**	**4.6**	**1.1**	**-**	**1.5**	**-**	**100.0**
			F. c.	0.92	0.01	0.06	0.81	0.15	0.03	-	0.02	-	2
58	45-1, 51	PdCu +DGN	**Wt.%**	**62.5**	**-**	**-**	**28.3**	**3.2**	**3.9**	**1.0**	**-**	**-**	**98.9**
			F. c.	1.01	-	-	0.77	0.10	0.10	0.02	-	-	2
59	45-1, 52	PdCu+CHC+BORN	**Wt.%**	**57.7**	**4.2**	**-**	**30.7**	**5.5**	**0.9**	**-**	**-**	**-**	**99.0**
			F. c.	0.93	0.04	-	0.83	0.17	0.03	-	-	-	2
60	45-1, 53	PDCu(zone 1)+KTH	**Wt.%**	**57.9**	**1.2**	**2.4**	**30.6**	**2.7**	**-**	**-**	**4.7**	**-**	**99.5**
			F. c.	0.96	0.01	0.02	0.85	0.09	-	-	0.07	-	2
61	45-1, 53	PdCu(zone 2)+KTH	**Wt.%**	**62.8**	**-**	**-**	**28.6**	**8.3**	**-**	**-**	**-**	**-**	**99.7**
			F. c.	0.99	-	-	0.76	0.25	-	-	-	-	2
62	45-1, 54	PdCu+CHC+BORN	**Wt.%**	**61.8**	**-**	**-**	**30.7**	**6.2**	**1.0**	**-**	**-**	**-**	**99.7**
			F. c.	0.98	-	-	0.81	0.19	0.02	-	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
63	45-1, 55	PdCu+CHC+BORN	**Wt.%**	**58.5**	**3.4**	**-**	**29.7**	**4.3**	**2.0**	**-**	**-**	**1.4**	**99.3**
			F. c.	0.96	0.03	-	0.82	0.13	0.05	-	-	0.01	2
64	45-1, 56	PdCu	**Wt.%**	**61.8**	**-**	**1.2**	**28.6**	**5.0**	**2.6**	**-**	**-**	**-**	**99.2**
			F. c.	1.00	-	0.01	0.77	0.15	0.07	-	-	-	2
65	45-1, 58	PdCu	**Wt.%**	**58.4**	**-**	**2.6**	**29.9**	**4.6**	**3.1**	**-**	**-**	**-**	**98.6**
			F. c.	0.95	-	0.02	0.81	0.14	0.08	-	-	-	2
66	45-1, 59	PdCu +KTH	**Wt.%**	**57.1**	**3.1**	**2.6**	**30.0**	**4.5**	**-**	**-**	**1.3**	**1.3**	**99.9**
			F. c.	0.95	0.03	0.02	0.83	0.14	-	-	0.02	0.01	2
67	45-1, 60	PdCu (zone 1)	**Wt.%**	**62.1**	**-**	**-**	**28.3**	**4.2**	**3.0**	**1.1**	**-**	**-**	**98.7**
			F. c.	1.00	-	-	0.77	0.13	0.08	0.02	-	-	2
68	45-1, 60	PdCu (zone 2)	**Wt.%**	**60.3**	**-**	**-**	**30.1**	**4.4**	**3.6**	**-**	**-**	**-**	**98.4**
			F. c.	0.97	-	-	0.81	0.13	0.09	-	-	-	2
69	45-1, 61	PdCu+CHC +BORN	**Wt.%**	**61.4**	**-**	**-**	**31.1**	**2.4**	**2.0**	**1.2**	**-**	**1.1**	**99.2**
			F. c.	1.00	-	-	0.85	0.07	0.05	0.02	-	0.01	2
70	45-1, 62	PdCu +BORN+CHC	**Wt.%**	**61.1**	**-**	**-**	**30.7**	**3.6**	**3.6**	**-**	**-**	**-**	**99.0**
			F. c.	0.98	-	-	0.82	0.11	0.09	-	-	-	2
71	45-1, 63	PdCu +BORN	**Wt.%**	**61.2**	**1.1**	**1.1**	**29.6**	**5.3**	**-**	**-**	**1.3**	**-**	**99.6**
			F. c.	0.99	0.01	0.01	0.81	0.16	-	-	0.02	-	2
72	45-1, 64	PdCu +BORN+CHC	**Wt.%**	**59.2**	**2.8**	**-**	**28.9**	**7.1**	**1.2**	**-**	**-**	**-**	**99.2**
			F. c.	0.95	0.02	-	0.78	0.22	0.03	-	-	-	2
73	45-1, 65	PdCu	**Wt.%**	**61.3**	**-**	**-**	**31.0**	**2.3**	**1.6**	**1.5**	**-**	**1.0**	**98.7**
			F. c.	1.00	-	-	0.85	0.07	0.04	0.02	-	0.01	2
74	45-1, 66	PdCu+BORN+CHC+CHL	**Wt.%**	**61.3**	**-**	**-**	**33.8**	**1.3**	**2.2**	**-**	**-**	**-**	**98.6**
			F. c.	0.99	-	-	0.91	0.04	0.06	-	-	-	2
75	45-1, 67	PdCu+CHC+BORN	**Wt.%**	**60.6**	**1.6**	**1.2**	**30.0**	**5.7**	**0.6**	**-**	**-**	**-**	**99.7**
			F. c.	0.97	0.01	0.01	0.81	0.18	0.02	-	-	-	2
75	45-1, 69	PdCu+BORN+CHC	**Wt.%**	**62.3**	**-**	**-**	**29.6**	**3.4**	**2.8**	**-**	**-**	**-**	**98.1**
			F. c.	1.01	-	-	0.81	0.11	0.07	-	-	-	2
77	45-1, 71	PdCu+CHC+BORN	**Wt.%**	**58.5**	**4.9**	**-**	**29.2**	**6.2**	**0.8**	**-**	**-**	**-**	**99.6**
			F. c.	0.95	0.04	-	0.80	0.19	0.02	-	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
78	45-1, 72	PdCu+BORN+CHC	**Wt.%**	**58.4**	**1.0**	-	**33.2**	**1.8**	**1.0**	-	**2.5**	**1.4**	**99.3**
			F. c.	0.96	0.01	-	0.91	0.06	0.03	-	0.03	0.01	2
79	45-1, 73	PdCu+BORN+CHC	**Wt.%**	**62.8**	-	-	**29.1**	**5.9**	**1.3**	-	-	-	**99.1**
			F. c.	1.01	-	-	0.78	0.18	0.03	-	-	-	2
80	45-1,76	(Pd,Au)Cu	**Wt.%**	**47.0**	-	**16.3**	**32.1**	**0.9**	**1.5**	-	**1.0**	-	**98.8**
			F. c.	0.82	-	0.15	0.94	0.03	0.04	-	0.02	-	2
81	45-1,77	PdCu+CHC	**Wt.%**	**62.6**	-	-	**30.3**	**6.2**	-	-	-	-	**99.1**
			F. c.	1.00	-	-	0.81	0.19	-	-	-	-	2
82	45-1, 78	(Pd,Pt)Cu+CHC+BORN+CPX	**Wt.%**	**53.4**	**10.0**	-	**28.8**	**6.9**	**0.6**	-	-	-	**99.7**
			F. c.	0.88	0.09	-	0.79	0.22	0.02	-	-	-	2
83	45-1, 79	PdCu+CHC+BORN	**Wt.%**	**62.3**	-	-	**29.7**	**3.4**	**2.6**	**1.2**	-	-	**99.2**
			F. c.	1.01	-	-	0.80	0.10	0.07	0.02	-	-	2
84	45-1, 80	PdCu+(Pd,Sn,Cu)+MT	**Wt.%**	**60.4**	-	-	**30.0**	**2.5**	**0.9**	**4.8**	-	**0.9**	**99.5**
			F. c.	0.99	-	-	0.83	0.08	0.02	0.07	-	0.01	2
85	45-1, 81	PdCu+ZV+BORN+PN-(Co)	**Wt.%**	**61.2**	-	**1.2**	**29.9**	**4.7**	**2.4**	-	-	-	**99.4**
			F. c.	0.98	-	0.01	0.81	0.14	0.06	-	-	-	2
86	45-1, 83	PdCu+CHC+BORN	**Wt.%**	**61.1**	-	-	**30.7**	**3.6**	**3.6**	-	-	-	**99.0**
			F. c.	0.98	-	-	0.82	0.11	0.09	-	-	-	2
87	45-1, 85	PdCu+CHC +BORN	**Wt.%**	**60.9**	-	-	**31.0**	**2.5**	**2.3**	-	**1.4**	**1.3**	**99.4**
			F. c.	0.99	-	-	0.84	0.08	0.06	-	0.02	0.01	2
88	45-1, 86	PdCu+MT	**Wt.%**	**60.4**	-	-	**30.0**	**3.5**	**1.4**	**2.9**	-	-	**98.2**
			F. c.	0.99	-	-	0.82	0.11	0.04	0.04	-	-	2
89	45-1, 87	PdCu(zone 1)+CHC	**Wt.%**	**56.5**	-	-	**40.4**	**1.3**	**1.5**	-	-	-	**99.7**
			F. c.	0.88	-	-	1.05	0.04	0.04	-	-	-	2
90	45-1, 87	Pd(Cu,Sn)(zone 2)+CHC	**Wt.%**	**56.7**	-	-	**18.8**	**2.0**	-	**20.5**	-	**1.1**	**99.1**
			F. c.	1.02	-	-	0.57	0.07	-	0.33	-	0.01	2
91	45-1,88	PdCu	**Wt.%**	**61.3**	-	**1.0**	**28.9**	**5.0**	**3.6**	-	-	-	**99.8**
			F. c.	0.98	-	0.01	0.77	0.15	0.09	-	-	-	2
92	45-1,89	PdCu+CPX	**Wt.%**	**55.0**	**1.9**	**5.5**	**30.8**	**3.9**	**0.6**	-	**1.2**	-	**98.9**
			F. c.	0.92	0.02	0.05	0.86	0.12	0.01	-	0.02	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
93	45-1,90	PdCu+BORN+CHC	**Wt.%**	**60.6**	**1.9**	-	**29.2**	**5.0**	**2.5**	-	-	-	**99.2**
			F. c.	0.98	0.02	-	0.79	0.15	0.06	-	-	-	2
94	45-1, 91	(Pd,Au)Cu(zone 1) + $PdAuCu_2$+BORN	**Wt.%**	**51.8**	-	**10.9**	**31.6**	**0.6**	-	**1.0**	**1.2**	**1.8**	**98.9**
			F. c.	0.90	-	0.10	0.92	0.02	-	0.02	0.02	0.2	2
95	45-1, 91	(Pd,Au)Cu(zone 2)+ $PdAuCu_2$+BORN	**Wt.%**	**35.3**	-	**30.7**	**29.9**	-	-	-	**2.4**	-	**98.3**
			F. c.	0.68	-	0.32	0.96	-	-	-	0.04	-	2
96	45-1, 92	PdCu+BORN+OPX	**Wt.%**	**60.2**	**2.3**	-	**28.0**	**7.7**	**1.2**	-	-	-	**99.4**
			F. c.	0.96	0.02	-	0.75	0.24	0.03	-	-	-	2
97	45-1, 93	PdCu+BORN+CHC	**Wt.%**	**60.8**	**1.2**	**1.0**	**30.3**	**5.4**	**1.1**	-	-	-	**99.8**
			F. c.	0.97	0.01	0.01	0.81	0.17	0.03	-	-	-	2
98	45-1, 94	PdCu+CHC	**Wt.%**	**63.3**	-	-	**28.6**	**5.1**	**2.4**	-	-	-	**99.4**
			F. c.	1.01	-	-	0.77	0.16	0.06	-	-	-	2
99	45-1, 95	PdCu+BORN	**Wt.%**	**58.5**	**3.1**	**1.9**	**27.8**	**4.7**	**2.3**	-	-	-	**98.3**
			F. c.	0.97	0.03	0.02	0.77	0.15	0.06	-	-	-	2
100	45-1, 96	PdCu+BORN	**Wt.%**	**60.9**	-	**1.3**	**28.7**	**4.8**	**2.7**	-	-	-	**98.4**
			F. c.	0.99	-	0.01	0.78	0.15	0.07	-	-	-	2
101	45-1, 97	(Pd,Au)Cu+CHC+BORN	**Wt.%**	**51.5**	-	**8.4**	**34.0**	**1.1**	-	-	**3.4**	-	**98.4**
			F. c.	0.87	-	0.08	0.96	0.04	-	-	0.05	-	2
102	45-1, 99	PdCu+CHC+BORN	**Wt.%**	**63.1**	-	-	**28.8**	**3.1**	**2.5**	**1.0**	-	**1.0**	**99.6**
			F. c.	1.03	-	-	0.79	0.10	0.06	0.01	-	0.01	2
103	45-1, 100	PdCu+BORN	**Wt.%**	**62.4**	-	-	**30.1**	**6.3**	-	-	-	-	**98.8**
			F. c.	1.00	-	-	0.81	0.19	-	-	-	-	2
104	45-1, 101	(Pd,Au)Cu+BORN+CHL	**Wt.%**	**42.0**	-	**21.3**	**34.7**	**1.6**	-	-	-	-	**99.6**
			F. c.	0.73	-	0.20	1.01	0.06	-	-	-	-	2
105	45-1, 102	PdCu+CHC+BORN+CT	**Wt.%**	**57.9**	**3.2**	-	**29.6**	**1.0**	**0.5**	**3.3**	-	**3.4**	**98.9**
			F. c.	0.99	0.03	-	0.85	0.03	0.02	0.05	-	0.03	2
106	45-1, 103	PdCu+CHL	**Wt.%**	**63.2**	-	-	**29.7**	**6.1**	**1.1**	-	-	-	**99.2**
			F. c.	1.00	-	-	0.79	0.18	0.03	-	-	-	2
107	45-1, 104	PdCu+BORN+OPX	**Wt.%**	**59.3**	**2.1**	**1.6**	**30.2**	**5.1**	-	-	-	-	**98.3**
			F. c.	0.98	0.02	0.01	0.83	0.16	-	-	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
108	45-1, 105	PdCu+BORN	**Wt.%**	**62.6**	-	-	**28.5**	**7.0**	**2.1**	**-**	**-**	**-**	**100.6**
			F. c.	0.99	**-**	**-**	0.75	0.21	0.05	-	-	-	2
109	45-1,106	PdCu+CHC+BORN+CHL	**Wt.%**	**59.2**	**3.6**	-	**29.0**	**5.7**	**1.0**	**-**	**-**	**-**	**98.5**
			F. c.	0.97	0.03	**-**	0.79	0.18	0.03	-	-	-	2
110	45-1,107	PdCu+BORN	**Wt.%**	**60.1**	**1.5**	**1.8**	**28.4**	**4.7**	**1.3**	**1.0**	**-**	**-**	**98.8**
			F. c.	0.99	0.01	0.02	0.78	0.15	0.03	0.01	-	-	2
111	45-1,108	(Pd,Pt)Cu+BORN+OPX	**Wt.%**	**57.6**	**5.8**	**-**	**30.0**	**5.6**	**0.9**	-	-	-	**99.9**
			F. c.	0.93	0.05	-	0.82	0.17	0.03	-	**-**	**-**	2
112	45-1,109	PdCu+BORN+CHL	**Wt.%**	**62.5**	**-**	**-**	**27.8**	**5.2**	**1.6**	**1.9**	**-**	**-**	**99.0**
			F. c.	1.01	-	-	0.76	0.16	0.04	0.03	-	-	2
113	45-1,110	PdCu	**Wt.%**	**63.7**	**-**	**-**	**28.5**	**3.9**	**2.8**	**-**	**-**	**-**	**98.9**
			F. c.	1.03	-	-	0.78	0.12	0.07	-	-	-	2
114	45-1, 111	PdCu+(Pd,Cu,Sn)+BORN	**Wt.%**	**59.0**	**1.3**	**1.4**	**29.1**	**1.6**	**0.5**	**4.3**	**-**	**2.3**	**99.5**
			F. c.	1.00	0.01	0.01	0.83	0.05	0.01	0.07	-	0.02	2
115	45-1, 112	PdCu+BORN+CHC	**Wt.%**	**62.2**	**1.0**	**1.0**	**29.1**	**6.1**	**0.5**	**-**	**-**	**-**	**99.9**
			F. c.	1.00	0.01	0.01	0.78	0.19	0.01	-	-	-	2
116	45-1, 113	PdCu+KTH+CHC+ANC	**Wt.%**	**58.7**	**3.7**	**0.8**	**28.1**	**4.6**	**2.6**	**-**	**0.8**	**-**	**99.3**
			F. c.	0.96	0.03	0.01	0.77	0.15	0.07	-	0.01	-	2
117	45-1, 114	PdCu+BORN	**Wt.%**	**61.5**	**-**	**1.0**	**29.3**	**4.3**	**1.7**	**1.1**	**-**	**-**	**98.9**
			F. c.	1.00	-	0.01	0.80	0.13	0.04	0.02	-	-	2
118	45-1, 115	PdCu+BORN+CHC	**Wt.%**	**59.7**	**-**	**-**	**33.5**	**2.2**	**2.2**	**-**	**-**	**0.9**	**98.5**
			F. c.	0.96	-	-	0.90	0.07	0.06	-	-	0.01	2
119	45-1, 116	PdCu+BORN+CPX	**Wt.%**	**58.3**	**3.0**	**2.1**	**28.6**	**5.9**	**-**	**-**	**1.8**	**-**	**99.7**
			F. c.	0.96	0.03	0.02	0.79	0.18	-	-	0.02	-	2
120	45-1, 117	PdCu+$PdAuCu_2$+KTH+BORN	**Wt.%**	**48.3**	**-**	**16.0**	**30.4**	**1.0**	**1.1**	**0.9**	**-**	**1.0**	**98.7**
			F. c.	0.86	-	0.15	0.90	0.03	0.03	0.02	-	0.01	2
121	45-1, 118	Pd(Cu,Sn)+BORN+CHC+MT	**Wt.%**	**58.3**	**1.0**	**-**	**30.3**	**1.1**	**-**	**7.6**	**-**	**1.0**	**99.3**
			F. c.	0.98	0.01	-	0.85	0.04	-	0.11	-	0.01	2
122	45-1, 119	PdCu+BORN+CHC	**Wt.%**	**57.5**	**1.1**	**5.1**	**31.5**	**3.0**	**-**	**-**	**-**	**-**	**98.7**
			F. c.	0.96	0.01	0.05	0.88	0.10	-	-	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
123	45-1, 120	PdCu+BORN	**Wt.%**	**61.6**	**-**	**2.2**	**28.0**	**4.9**	**2.3**	**-**	**-**	**-**	**99.0**
			F. c.	1.00	-	0.02	0.77	0.15	0.06	-	-	-	2
124	45-1, 121	(Pd,Pt)Cu+BORN+MT	**Wt.%**	**56.2**	**5.6**	**-**	**29.2**	**5.6**	**1.5**	**-**	**1.0**	**-**	**99.0**
			F. c.	0.93	0.05	-	0.80	0.17	0.04	-	0.01	-	2
125	45-1, 122	PdCu+VSL+KTH	**Wt.%**	**59.7**	**2.0**	**1.6**	**29.7**	**4.9**	**0.4**	**-**	**0.9**	**-**	**99.2**
			F. c.	0.98	0.02	0.01	0.82	0.15	0.01	-	0.01	-	2
126	45-1, 123	PdCu+BORN+CHC	**Wt.%**	**58.6**	**1.0**	**-**	**34.6**	**3.3**	**2.1**	-	-	-	**99.6**
			F. c.	0.92	0.01	-	0.92	0.10	0.05	-	-	-	2
127	45-1,124	PdCu+$PdCu_3$+BORN	**Wt.%**	**62.2**	**-**	**1.0**	**31.8**	**1.0**	**1.0**	**-**	**2.8**	**-**	**99.8**
			F. c.	1.02	-	0.01	0.87	0.03	0.03	-	0.04	-	2
128	45-1,125	(Pd,Pt)Cu+BORN+CHC	**Wt.%**	**56.4**	**6.7**	-	**29.1**	**5.1**	**1.4**	**-**	**-**	**-**	**98.7**
			F. c.	0.93	0.06	-	0.81	0.16	0.04	-	-	-	2
129	45-1,126	PdCu+BORN+CHC	**Wt.%**	**58.3**	**4.3**	**-**	**29.6**	**5.9**	**0.5**	**-**	**-**	**-**	**98.6**
			F. c.	0.96	0.04	-	0.81	0.18	0.01	-	-	-	2
130	45-1, 127	PdCu+BORN	**Wt.%**	**61.5**	**-**	**-**	**32.0**	**0.6**	**1.4**	**2.2**	**-**	**2.2**	**99.9**
			F. c.	1.01	-	-	0.88	0.02	0.04	0.03	-	0.02	2
131	45-1, 128	PdCu	**Wt.%**	**62.1**	**-**	**1.2**	**29.3**	**4.0**	**2.7**	**-**	**-**	**-**	**99.3**
			F. c.	1.00	-	0.01	0.79	0.12	0.07	-	-	-	2
132	45-1, 129	PdCu+BORN+CP	**Wt.%**	**59.7**	**1.1**	**2.8**	**28.2**	**4.4**	**2.3**	**-**	**-**	**1.0**	**99.5**
			F. c.	0.98	0.01	0.02	0.78	0.14	0.06	-	-	0.01	2
133	45-1, 130	PdCu	**Wt.%**	**62.2**	**-**	**-**	**29.3**	**5.6**	**2.1**	**-**	**-**	**-**	**99.2**
			F. c.	0.99	-	-	0.78	0.17	0.05	-	-	-	2
134	45-1, 131	PdCu+ZV+ BORN+CHC	**Wt.%**	**62.5**	**-**	**1.1**	**29.2**	**4.0**	**2.6**	**-**	**-**	**-**	**99.4**
			F. c.	1.01	-	0.01	0.79	0.12	0.07	-	-	-	2
135	45-1, 134	PdCu	**Wt.%**	**60.0**	-	-	**32.5**	**4.1**	**1.6**	**-**	**-**	**-**	**98.2**
			F. c.	0.96	-	-	0.87	0.13	0.04	-	-	-	2
136	45-1, 135	PdCu+BORN+CHC	**Wt.%**	**61.4**	-	-	**31.4**	**2.0**	**1.5**	**2.1**	**-**	**1.2**	**99.6**
			F. c.	1.00	-	-	0.86	0.06	0.04	0.03	-	0.01	2
137	45-1,136	PdCu+CHC	**Wt.%**	**59.2**	**1.0**	**-**	**34.0**	**4.9**	**-**	-	-	-	**99.1**
			F. c.	0.94	0.01	-	0.90	0.15	-	-	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
138	45-1,137	(Pt,Pd)(Cu,Sn)+(Pt,Pd)Cu_3+BORN +CHC	**Wt.%**	**44.7**	**12.7**	-	**19.3**	**1.5**	-	**21.4**	-	-	**99.3**
			F. c.	0.84	0.14	-	0.62	0.04	-	0.36	-	-	2
139	45-1,138	(Pd,Pt)Cu+CHC+BORN	**Wt.%**	**56.8**	**6.6**	**1.0**	**30.6**	**5.5**	**1.0**	-	-	-	**101.5**
			F. c.	0.92	0.06	0.01	0.83	017	0.02	-	-	-	2
140	45-1,139	Pd(Cu,Sn)+(Pd,Cu,Sn)+BORN	**Wt.%**	**59.6**	**1.3**	**1.1**	**30.4**	**1.3**	**0.7**	**5.2**	-	-	**99.6**
			F. c.	0.99	0.01	0.01	0.85	0.04	0.02	0.08	-	-	2
141	45-1,140	PdCu+CHC	**Wt.%**	**59.0**	-	**2.6**	**32.4**	**2.8**	**1.0**	-	**1.0**	-	**98.8**
			F. c.	0.96	-	0.02	0.89	0.09	0.03	-	0.01	-	2
142	45-1,142	(Pd,Pt)Cu+BORN	**Wt.%**	**55.7**	**7.2**	-	**28.1**	**7.3**	**0.9**	-	-	-	**99.2**
			F. c.	0.91	0.07	-	0.77	0.23	0.02	-	-	-	2
143	45-1,143	PdCu	**Wt.%**	**61.0**	-	-	**30.1**	**2.3**	**1.8**	**3.7**	-	**0.8**	**99.7**
			F. c.	1.00	-	-	0.82	0.07	0.05	0.05	-	0.01	2
144	45-1, 144	Pd(Cu,Sn)+PdCu_3+CHC+BORN	**Wt.%**	**56.2**	**2.7**	-	**27.9**	**0.8**	-	**9.6**	-	**2.2**	**99.4**
			F. c.	0.97	0.03	-	0.81	0.02	-	0.15	-	0.02	2
145	45-1,146	PdCu+CHC	**Wt.%**	**55.9**	**4.8**	-	**33.2**	**1.7**	**0.5**	-	-	**3.1**	**99.2**
			F. c.	0.94	0.04	-	0.93	0.05	0.01	-	-	0.03	2
146	45-1, 147	PdCu+BORN+CHL	**Wt.%**	**63.1**	-	-	**28.8**	**5.3**	**2.3**	-	-	-	**99.5**
			F. c.	1.01	-	-	0.77	0.16	0.06	-	-	-	2
147	45-1, 150	(Pd,Pt)Cu+CHC+BORN	**Wt.%**	**55.7**	**5.5**	-	**30.3**	**5.9**	**0.8**	-	-	-	**98.2**
			F. c.	0.92	0.05	-	0.83	0.18	0.02	-	-	-	2
148	45-1, 152	PdCu	**Wt.%**	**60.0**	-	**1.0**	**30.0**	**1.1**	**0.6**	**4.7**	-	**1.2**	**98.6**
			F. c.	1.01	-	0.01	0.85	0.04	0.02	0.07	-	0.01	2
149	45-1, 153	PdCu	**Wt.%**	**55.8**	**3.6**	**4.0**	**29.4**	**4.4**	**0.5**	-	**1.5**	-	**99.2**
			F. c.	0.93	0.03	0.04	0.82	0.14	0.02	-	0.02	-	2
150	45-1, 154	PdCu+CP+BORN	**Wt.%**	**60.1**	**1.8**	**1.4**	**28.6**	**4.2**	**2.9**	-	-	-	**99.0**
			F. c.	0.98	0.02	0.01	0.78	0.13	0.08	-	-	-	2
151	45-1, 156	(Pd,Pt)Cu+BORN+MT	**Wt.%**	**53.7**	**10.1**	-	**26.7**	**4.5**	**1.2**	**1.1**	-	**1.7**	**99.0**
			F. c.	0.92	0.09	-	0.77	0.15	0.04	0.02	-	0.01	2
152	45-1, 157	PdCu+(Pd,Cu,Sn)+BORN+CHC	**Wt.%**	**62.0**	-	-	**30.2**	**1.9**	**1.5**	**2.9**	-	**1.3**	**99.8**
			F. c.	1.02	-	-	0.83	0.06	0.04	0.04	-	0.01	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
153	45-1, 158	(Pd,Au)Cu+KTH+$PdAuCu_2$+BORN	**Wt.%**	**44.0**	**3.0**	**18.6**	**31.1**	**1.4**	**1.1**	-	-	-	**99.2**
			F. c.	0.78	0.03	0.18	0.93	0.05	0.03	-	-	-	2
154	45-1, 159	PdCu+CHC+BORN	**Wt.%**	**62.0**	-	-	**32.6**	**0.4**	-	**3.6**	-	**1.2**	**99.8**
			F. c.	1.03	-	-	0.90	0.01	-	0.05	-	0.01	2
155	45-1, 160	PdCu	**Wt.%**	**61.0**	**1.3**	-	**30.6**	**5.2**	**0.5**	-	-	**1.0**	**99.6**
			F. c.	0.98	0.01	-	0.82	0.16	0.02	-	-	0.01	2
156	45-1, 160	PdCu+BORN	**Wt.%**	**59.7**	**4.0**	-	**28.2**	**6.2**	**1.3**	-	-	-	**99.4**
			F. c.	0.97	0.04	-	0.77	0.19	0.03	-	-	-	2
157	45-1, 162	(Pd,Au)Cu (zone1)	**Wt.%**	**50.8**	**1.1**	**9.0**	**32.2**	**0.6**	**0.7**	**2.0**	**1.0**	**1.8**	**99.2**
			F. c.	0.87	0.01	0.08	0.93	0.02	0.02	0.03	0.02	0.02	2
158	45-1, 162	(Pd,Au)Cu (zone2)	**Wt.%**	**34.8**	**1.1**	**28.3**	**31.4**	**0.5**	-	-	**2.6**	-	**98.7**
			F. c.	0.65	0.01	0.29	0.99	0.02	-	-	0.04	-	2
159	45-1, 163	PdCu+BORN+CHC	**Wt.%**	**61.9**	-	-	**28.7**	**5.6**	**3.1**	-	-	-	**99.3**
			F. c.	0.99	-	-	0.76	0.17	0.08	-	-	-	2
160	45-1, 164	PdCu+BORN	**Wt.%**	**62.3**	-	**1.7**	**28.4**	**4.4**	**2.7**	-	-	-	**99.5**
			F. c.	1.01	-	0.01	0.77	0.14	0.07	-	-	-	2
161	45-1,165	(Pd,Au)(Cu,Sn)+TFP+ BORN+CHC	**Wt.%**	**53.8**	**3.1**	**5.3**	**15.8**	**1.7**	-	**17.9**	**0.7**	-	**98.3**
			F. c.	0.98	0.03	0.05	0.48	0.06	-	0.29	0.01	-	2
162	45-1, 166	PdCu+DGN+BORN	**Wt.%**	**62.2**	-	-	**30.6**	**5.4**	**0.61**	-	-	-	**98.9**
			F. c.	1.00	-	-	0.82	0.16	0.02	-	-	-	2
163	45-1, 167	PdCu	**Wt.%**	**59.1**	-	**2.8**	**30.6**	**3.7**	**2.1**	-	**1.1**	-	**99.4**
			F. c.	0.96	-	0.03	0.83	0.11	0.06	-	0.01	-	2
164	45-1, 168	Pd(Cu,Sn)+TFP?+HNG+BORN+CHC	**Wt.%**	**55.7**	**4.2**	-	**30.1**	**0.89**	**0.38**	**6.2**	-	**1.3**	**98.77**
			F. c.	0.95	0.04	-	0.86	0.03	0.01	0.10	-	0.01	2
165	45-1, 169	(Pd,Au)Cu+CHC	**Wt.%**	**48.8**	-	**9.5**	**37.4**	**1.0**	**1.3**	-	-	-	**98.0**
			F. c.	0.81	-	0.09	1.04	0.03	0.03	-	-	-	2
166	45-1, 170	(Pd,Au)Cu+CHC+BORN	**Wt.%**	**46.8**	**1.2**	**16.6**	**31.0**	**0.79**	**0.53**	**1.6**	-	**1.1**	**99.62**
			F. c.	0.83	0.01	0.16	0.92	0.03	0.01	0.03	-	0.01	2
167	45-1, 171	PdCu+BORN+CHC	**Wt.%**	**62.7**	-	-	**29.5**	**5.8**	**1.3**	-	-	-	**99.3**
			F. c.	1.00	-	-	0.79	0.17	0.03	-	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
168	45-1,173	PdCu	**Wt.%**	**62.1**	**-**	**-**	**28.9**	**6.2**	**1.9**	**-**	**-**	**-**	**99.1**
			F. c.	0.99	-	-	0.77	0.19	0.05	-	-	-	2
169	45-1,174	PdCu+CHC	**Wt.%**	**60.7**	**-**	**2.6**	**28.0**	**4.6**	**3.9**	**-**	**-**	**-**	**99.8**
			F. c.	0.98	-	0.02	0.76	0.14	0.10	-	-	-	2
170	45-1,176	PdCu+CHC+BORN	**Wt.%**	**60.5**	**-**	**-**	**34.3**	**1.6**	**0.71**	**1.7**	**-**	**-**	**98.81**
			F. c.	0.98	-	-	0.93	0.05	0.02	0.02	-	-	2
171	45-1, 178	PdCu	**Wt.%**	**62.2**	**-**	**-**	**28.7**	**6.7**	**1.0**	**-**	**-**	**-**	**98.6**
			F. c.	1.00	-	-	0.77	0.20	0.03	-	-	-	2
172	45-1, 179	(Pd,Au)Cu(zone 1)	**Wt.%**	**33.0**	**1.2**	**31.5**	**28.4**	**1.3**	**0.53**	**-**	**2.3**	**1.1**	**99.33**
			F. c.	0.63	0.01	0.33	0.91	0.05	0.02	-	0.04	0.01	2
173	45-1, 179	(Pd,Au)Cu(zone 1)	**Wt.%**	**51.5**	**1.2**	**10.9**	**30.4**	**2.2**	**1.3**	**-**	**0.9**	**1.1**	**99.5**
			F. c.	0.89	0.01	0.10	0.87	0.07	0.04	-	0.01	0.01	2
174	45-1,180	PdCu	**Wt.%**	**62.0**	**-**	**-**	**29.4**	**4.5**	**2.0**	**1.2**	**-**	**-**	**99.1**
			F. c.	1.00	-	-	0.79	0.14	0.05	0.02	-	-	2
175	45-1,181	(Pd,Au)Cu+CHC+BORN	**Wt.%**	**36.8**	**2.1**	**26.1**	**33.6**	**0.52**	**0.45**	**-**	**-**	**-**	**99.87**
			F. c.	0.67	0.02	0.26	1.02	0.02	0.01	-	-	-	2
176	45-1,182	PdCu (zone 1)+BORN+CHC	**Wt.%**	**60.9**	**-**	**1.8**	**28.0**	**5.2**	**3.1**	**-**	**-**	**-**	**99.0**
			F. c.	0.99	-	0.01	0.76	0.16	0.08	-	-	-	2
177	45-1,182	(Pd,Au)Cu (zone 2)+BORN+CHC	**Wt.%**	**54.2**	**-**	**7.4**	**31.1**	**0.81**	**0.82**	**2.2**	**1.9**	**1.4**	**99.83**
			F. c.	0.92	-	0.07	0.89	0.03	0.02	0.03	0.03	0.01	2
178	45-1, 183	PdCu	**Wt.%**	**62.2**	**-**	**-**	**27.6**	**6.3**	**2.6**	**-**	**-**	**-**	**98.7**
			F. c.	1.00	-	-	0.74	0.19	0.07	-	-	-	2
179	45-1, 184	PdCu	**Wt.%**	**61.3**	**1.0**	**1.2**	**27.7**	**5.2**	**2.4**	**-**	**-**	**-**	**98.8**
			F. c.	1.00	0.01	0.01	0.76	0.16	0.06	-	-	-	2
180	45-1, 185	(Pd,Pt)Cu+BORN+CHC	**Wt.%**	**57.4**	**5.1**	**-**	**30.1**	**5.8**	**0.87**	**-**	**-**	**-**	**99.27**
			F. c.	0.93	0.05	-	0.82	0.18	0.02	-	-	-	2
181	45-1, 186	PdCu+DGN+BORN	**Wt.%**	**61.8**	**-**	**-**	**30.0**	**0.65**	**0.65**	**-**	**-**	**5.4**	**98.5**
			F. c.	1.05	-	-	0.86	0.02	0.02	-	-	0.05	2
182	45-1, 187	(Pd,Au)Cu+CHC+BORN	**Wt.%**	**51.4**	**4.0**	**7.5**	**31.0**	**2.4**	**1.8**	**1.0**	**-**	**-**	**99.1**
			F. c.	0.87	0.04	0.07	0.88	0.07	0.05	0.02	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
183	45-1, 188	(Pd,Pt)Cu+CHC+BORN	**Wt.%**	**54.1**	**8.2**	**-**	**30.1**	**5.3**	**1.0**	**-**	**-**	**-**	**98.7**
			F. c.	0.90	0.07	-	0.83	0.17	0.03	-	-	-	2
184	45-1,189	PdCu+BORN	**Wt.%**	**62.9**	**-**	**-**	**29.6**	**5.6**	**1.6**	**-**	**-**	**-**	**99.7**
			F. c.	1.00	-	-	0.79	0.17	0.04	-	-	-	2
185	45-1,190	PdCu+CHC	**Wt.%**	**61.7**	**-**	**-**	**29.0**	**5.2**	**2.5**	**-**	**-**	**-**	**98.4**
			F. c.	0.99	-	-	0.78	0.16	0.07	-	-	-	2
186	45-1,191	PdCu +$PdCu_3$+CHC	**Wt.%**	**61.2**	**-**	**-**	**30.2**	**0.47**	**1.6**	**4.8**	**-**	**1.2**	**99.47**
			F. c.	1.02	-	-	0.84	0.02	0.04	0.07	-	0.01	2
187	45-2,1	(Pd,Au)Cu (zone 1)+$PdCu_3$+CHC+BORN	**Wt.%**	**50.7**	**-**	**10.7**	**31.9**	**0.43**	**0.44**	**1.3**	**1.2**	**2.1**	**98.77**
			F. c.	0.88	-	0.10	0.93	0.02	0.01	0.02	0.03	0.01	2
188	45-2,1	(Pd,Au)Cu (zone 2)+$PdCu_3$+CHC	**Wt.%**	**32.7**	**-**	**28.0**	**35.0**	**0.72**	**-**	**-**	**3.4**	**-**	**100.02**
			F. c.	0.59	-	0.27	1.06	0.03	-	-	0.05	-	2
189	45-2,2	PdCu+CHC+BORN	**Wt.%**	**62,7**	**-**	**-**	**29.9**	**2.7**	**2.8**	**1.0**	**-**	**-**	**99.1**
			F. c.	1.02	-	-	0.81	0.08	0.07	0.02	-	-	2
190	45-2,4	PdCu+CHC	**Wt.%**	**63.3**	**-**	**-**	**28.8**	**6.7**	**-**	**-**	**-**	**-**	**98.7**
			F. c.	1.02	-	-	0.78	0.20	-	-	-	-	2
191	45-2,5	Pd(Cu,Sn)+(Pd,Cu,Sn)	**Wt.%**	**60.2**	**-**	**1.3**	**29.0**	**0.78**	**0.52**	**7.3**	**-**	**-**	**99.1**
			F. c.	1.02	-	0.01	0.82	0.03	0.01	0.11	-	-	2
192	45-2,6	(Pd,Au)Cu	**Wt.%**	**53.9**	**-**	**10.0**	**31.4**	**1.6**	**1.8**	**-**	**-**	**-**	**98.7**
			F. c.	0.92	-	0.09	0.89	0.05	0.05	-	-	-	2
193	45-2,7	PdCu+BORN	**Wt.%**	**62.1**	-	-	**29.7**	**6.3**	**1.5**	**-**	**-**	**-**	**99.6**
			F. c.	0.98	-	-	0.79	0.19	0.04	-	-	-	2
194	45-2, 8	PdCu+BORN	**Wt.%**	**62.2**	**-**	**-**	**30.1**	**5.6**	**1.8**	**-**	**-**	**-**	**99.7**
			F. c.	0.99	-	-	0.80	0.17	0.04	-	-	-	2
195	45-2, 9	PdCu+BORN	**Wt.%**	**63.4**	**-**	**-**	**30.9**	**2.5**	**1.7**	**0.91**	**-**	**-**	**99.41**
			F. c.	1.03	-	-	0.84	0.08	0.04	0.01	-	-	2
196	45-2, 10	PdCu	**Wt.%**	**59.3**	**1.4**	**1.9**	**28.4**	**2.4**	**1.3**	**3.2**	**-**	**1.8**	**99.7**
			F. c.	0.99	0.01	0.02	0.80	0.08	0.03	0.05	-	0.02	2
197	45-2, 12	Pd(Cu,Sn)+(Pd,Cu,Sn)	**Wt.%**	**59.8**	**1.7**	**3.4**	**16.6**	**0.92**	**-**	**15.2**	**-**	**2.2**	**99.82**
			F. c.	1.12	0.01	0.02	0.26	0.02	-	0.13	-	0.01	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
198	45-2, 13	PdCu+BORN+CHC	Wt.%	60.2	-	2.6	28.8	4.3	2.9	-	-	-	98.8
			F. c.	0.98	-	0.02	0.79	0.13	0.08	-	-	-	2
199	45-2, 14	PdCu+BORN	Wt.%	63.0	-	-	29.8	3.7	2.4	-	-	-	98.9
			F. c.	0.99	-	-	0.81	0.11	0.06	-	-	-	2
200	45-2,15	(Pd,Au)Cu+Pd_3Cu+CHC+BORN	Wt.%	37.3	-	25.1	33.1	0.68	-	-	2.5	1.1	99.78
			F. c.	0.68	-	0.25	1.01	0.02	-	-	0.04	0.01	2
201	45-2,16	PdCu+CHC+BORN	Wt.%	59.8	1.2	-	30.7	4.4	0.56	-	1.8	-	98.46
			F. c.	0.97	0.01	-	0.84	0.14	0.01	-	0.03	-	2
202	45-2,17	PdCu+BORN	Wt.%	62.3	-	-	28.6	6.8	0.62	-	-	-	98.32
			F. c.	1.00	-	-	0.77	0.21	0.02	-	-	-	2
203	45-2,18	PdCu+CHC+BORN	Wt.%	61.1	-	-	29.6	2.7	2.1	1.4	-	1.3	98.2
			F. c.	1.01	-	-	0.82	0.08	0.06	0.02	-	0.01	2
204	45-2,19	PdCu+BORN	Wt.%	62.0	-	1.3	28.8	4.3	2.4	-	-	-	98.8
			F. c.	1.01	-	0.01	0.79	0.13	0.06	-	-	-	2
205	45-2,20	(Pd,Pt)Cu+CHC+BORN	Wt.%	56.6	5.5	-	30.0	4.7	1.3	-	-	-	98.1
			F. c.	0.94	0.05	-	0.83	0.15	0.03	-	-	-	2
206	45-2,21	PdCu+BORN	Wt.%	62.1	-	-	29.7	6.5	0.59	-	-	-	98.89
			F. c.	0.99	-	-	0.79	0.20	0.02	-	-	-	2
207	45-2,22	(Pd,Au)Cu	Wt.%	50.8	1.4	11.0	30.9	2.2	0.39	-	2.2	-	98.89
			F. c.	0.88	0.02	0.10	0.89	0.07	0.01	-	0.03	-	2
208	45-2,23	Pd(Cu,Sn0	Wt.%	57.1	2.7	1.6	27.0	1.0	0.40	7.0	-	3.2	100.0
			F. c.	0.99	0.03	0.01	0.79	0.03	0.01	0.11	-	0.03	2
209	45-2,24	PdCu+CP	Wt.%	56.6	1.4	4.7	28.7	3.2	1.6	-	2.0	1.1	99.3
			F. c.	0.95	0.01	0.04	0.81	0.10	0.05	-	0.03	0.01	2
210	45-2, 25	PdCu+BORN+CHC	Wt.%	55.4	1.4	1.0	37.4	2.9	-	-	1.5	-	99.6
			F. c.	0.88	0.01	0.01	0.99	0.09	-	-	0.02	-	2
211	45-2, 26	PdCu+BORN+CHC	Wt.%	57.2	3.1	1.7	29.2	4.7	1.1	-	1.6	-	98.6
			F. c.	0.95	0.03	0.01	0.81	0.15	0.03	-	0.02	-	2
212	45-2, 27	PdCu+BORN	Wt.%	62.7	-	-	28.9	5.5	2.1	-	-	-	99.2
			F. c.	1.00	-	-	0.78	0.17	0.05	-	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
213	45-2, 28	Pd(Cu,Sn)+CHC	**Wt.%**	**58.9**	**1.1**	**1.9**	**29.2**	**1.1**	**-**	**5.4**	**-**	**2.1**	**99.7**
			F. c.	1.01	0.01	0.02	0.83	0.04	-	0.08	-	0.02	2
214	45-2, 29	PdCu+CHC	**Wt.%**	**58.6**	**3.9**	**1.0**	**28.4**	**5.4**	**1.0**	**-**	**-**	**-**	**98.3**
			F. c.	0.97	0.03	0.01	0.79	0.17	0.03	-	-	-	2
215	45-2, 30	PdCu+CHC+BORN	**Wt.%**	**59.8**	**1.2**	**-**	**28.9**	**4.3**	**2.2**	**-**	**1.6**	**1.2**	**99.2**
			F. c.	0.98	0.01	-	0.79	0.13	0.06	-	0.02	0.01	2
216	45-2, 31	PdCu+CHC+BORN	**Wt.%**	**56.2**	**4.3**	**2.0**	**30.2**	**5.5**	**0.93**	**-**	**0.6**	**-**	**99.73**
			F. c.	0.92	0.04	0.02	0.82	0.17	0.02	-	0.01	-	2
217	45-2, 32	PdCu	**Wt.%**	**62.3**	**-**	**-**	**29.4**	**4.7**	**2.4**	**-**	**-**	**-**	**98.9**
			F. c.	1.00	-	-	0.79	0.14	0.07	-	-	-	2
218	45-2, 34	(Pd,Au)Cu+$PdAuCu_2$	**Wt.%**	**46.3**	**1.0**	**17.5**	**32.0**	**0.81**	**0.56**	**0.86**	**-**	**-**	**99.03**
			F. c.	0.82	0.01	0.17	0.95	0.02	0.02	0.01	-	-	2
219	45-2, 35	PdCu+CHC	**Wt.%**	**60.7**	**2.9**	**-**	**28.8**	**6.2**	**0.86**	**-**	**-**	**-**	**99.46**
			F. c.	0.98	0.03	-	0.78	0.19	0.02	-	-	-	2
220	45-2, 37	(Pd,Au)Cu (zone1)+CHC	**Wt.%**	**39.8**	**-**	**23.3**	**31.4**	**0.83**	**-**	**-**	**3.1**	**-**	**98.43**
			F. c.	0.73	-	0.23	0.96	0.03	-	-	0.05	-	2
221	45-2, 37	(Pd,Au)Cu (zone2)+CHC	**Wt.%**	**52.8**	**-**	**8.9**	**32.1**	**1.0**	**0.53**	**2.4**	**1.7**	**-**	**99.43**
			F. c.	0.90	-	0.08	0.91	0.03	0.02	0.04	0.02	-	2
222	45-2, 39	PdCu+CHC+ILM	**Wt.%**	**62.2**	**-**	**-**	**29.6**	**4.9**	**1.9**	**-**	**-**	**-**	**98.6**
			F. c.	1.00	-	-	0.80	0.15	0.05	-	-	-	2
223	45-2, 42	(Pd,Au)Cu +$PdCu_3$	**Wt.%**	**52.2**	**-**	**9.8**	**32.4**	**0.93**	**0.46**	**1.2**	**1.3**	**1.7**	**99.99**
			F. c.	0.89	-	0.09	0.92	0.03	0.01	0.02	0.02	0.02	2
224	45-2, 44	(Pd,Pt)Cu	**Wt.%**	**53.3**	**9.6**	**-**	**28.0**	**7.3**	**1.1**	**-**	**-**	**-**	**99.3**
			F. c.	0.88	0.09	-	0.77	0.23	0.03	-	-	-	2
225	45-2, 45	PdCu	**Wt.%**	**61.7**	**-**	**-**	**33.2**	**3.3**	**1.7**	**-**	**-**	**-**	**99.9**
			F. c.	0.98	-	-	0.88	0.10	0.04	-	-	-	2
226	45-2, 47	PdCu+BORN	**Wt.%**	**61.3**	**-**	**2.1**	**28.8**	**4.2**	**2.4**	**-**	**-**	**-**	**98.8**
			F. c.	1.00	-	0.02	0.79	0.13	0.06	-	-	-	2
227	45-2, 49	PdCu+CHC	**Wt.%**	**62.9**	**-**	**-**	**31.6**	**4.0**	**0.55**	**0.79**	**-**	**-**	**99.84**
			F. c.	1.01	-	-	0.85	0.12	0.01	0.01	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
228	45-2, 55	PdCu+ILM	**Wt.%**	**63.1**	**-**	**-**	**27.6**	**6.3**	**2.0**	**-**	**-**	**-**	**99.0**
			F. c.	1.01	-	-	0.74	0.20	0.05	-	-	-	2
			F. c.	1.00	0.01	-	0.77	0.15	0.07	-	-	-	2
229	45-2, 58	PdCu+BORN	**Wt.%**	**61.3**	**1.6**	**-**	**28.1**	**5.0**	**2.5**	**-**	**-**	**-**	**98.5**
			F. c.	1.00	0.01	-	0.77	0.15	0.07	-	-	-	2
230	45-2, 60	(Pd,Au)Cu	**Wt.%**	**52.9**	**-**	**9.7**	**31.6**	**2.8**	**0.75**	**-**	**1.5**	**-**	**99.25**
			F. c.	0.89	-	0.09	0.89	0.09	0.02	-	0.02	-	2
231	45-2, 61	PdCu+KTH+CHC+BORN	**Wt.%**	**59.0**	**3.3**	**1.1**	**28.8**	**3.1**	**1.2**	**0.53**	**1.9**	**1.0**	**99.93**
			F. c.	0.98	0.03	0.01	0.80	0.10	0.03	0.01	0.03	0.01	2
232	45-2, 62	PdCu+BORN+CHC	**Wt.%**	**62.0**	**-**	**-**	**30.4**	**5.1**	**0.52**	**-**	**-**	**1.0**	**99.02**
			F. c.	1.00	-	-	0.82	0.16	0.01	-	-	0.01	2
233	45-2, 63	PdCu	**Wt.%**	**57.3**	**1.9**	**1.6**	**28.1**	**1.3**	**7.2**	**-**	**-**	**1.5**	**98.9**
			F. c.	0.99	0.02	0.02	0.81	0.04	0.11	-	-	0.01	2
234	45-2, 65	(Pd,Au)Cu+PdAuCu$_2$+BORN+CHC	**Wt.%**	**49.5**	**1.3**	**12.9**	**30.1**	**1.3**	**1.2**	**1.3**	**-**	**2.4**	**100.0**
			F. c.	0.87	0.01	0.12	0.88	0.04	0.04	0.02	-	0.02	2
235	45-2, 66	(Pd,Au)Cu+CHL	**Wt.%**	**52.6**	**-**	**9.2**	**31.4**	**2.5**	**-**	**-**	**2.1**	**1.0**	**98.8**
			F. c.	0.90	-	0.08	0.90	0.08	-	-	0.03	0.01	2
236	45-2, 67	PdCu	**Wt.%**	**62.2**	**-**	**1.1**	**28.3**	**5.0**	**2.4**	**-**	**-**	**-**	**99.0**
			F. c.	1.00	-	0.01	0.77	0.16	0.06	-	-	-	2
237	75, 3	PdCu+BORN+CHC+PL+EP	**Wt.%**	**64.4**	-	-	**30.3**	**6.4**	**0.39**	-	-	-	**101.49**
			F. c.	1.01	-	-	0.79	0.19	0.01	-	-	-	2
238	75, 4	PdCu+BORN	**Wt.%**	**62.3**	**-**	**-**	**29.4**	**4.7**	**1.5**	**1.4**	**-**	**-**	**99.3**
			F. c.	1.00	-	-	0.80	0.14	0.04	0.02	-	-	2
239	75, 5	PdCu+BORN+CP	**Wt.%**	**60.6**	**-**	**-**	**31.0**	**4.4**	**1.3**	**1.3**	**-**	**-**	**98.6**
			F. c.	0.98	-	-	0.84	0.13	0.03	0.02	-	-	2
240	75, 6	PdCu+BORN	**Wt.%**	**62.7**	-	-	**28.9**	**5.8**	**1.7**	-	-	-	**99.1**
			F. c.	1.00	-	-	0.78	0.18	0.04	-	-	-	2
241	75, 7	PdCu	**Wt.%**	**60.9**	**-**	**1.1**	**30.3**	**3.5**	**2.1**	**1.4**	-	-	**99.3**
			F. c.	0.98	-	0.01	0.82	0.11	0.06	0.02	-	-	2
242	75, 9	(Pd,Au)Cu+PdAuCu$_2$+BORN+OPX	**Wt.%**	**46.3**	**1.0**	**17.6**	**30.1**	**0.97**	**1.5**	**-**	**1.5**	**-**	**98.97**
			F. c.	0.83	0.01	0.17	0.90	0.03	0.04	-	0.02	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
243	75, 8	PdCu+ BORN+CHC+MT	**Wt.%**	**61.4**	**-**	**-**	**32.1**	**1.0**	**0.34**	**4.6**	**-**	**-**	**99.44**
			F. c.	1.01	-	-	0.88	0.03	0.01	0.07	-	-	2
244	75, 13	PdCu+ZV+BORN	**Wt.%**	**59.9**	**-**	**3.0**	**29.7**	**4.0**	**2.3**	**-**	**0.82**	**-**	**99.72**
			F. c.	0.97	-	0.03	0.81	0.12	0.06	-	0.01	-	2
245	75, 14	PdCu+BORN+OPX+MT	**Wt.%**	**61.7**	**-**	**-**	**30.6**	**3.9**	**0.74**	**2.2**	**-**	**-**	**99.14**
			F. c.	1.00	-	-	0.83	0.12	0.02	0.03	-	-	2
246	75, 18	PdCu+CHC+BORN	**Wt.%**	**63.3**	**-**	**-**	**28.5**	**4.7**	**2.0**	**-**	**-**	**-**	**98.5**
			F. c.	1.03	-	-	0.78	0.14	0.05	-	-	-	2
247	75, 19	PdCu+CHC+BORN+MT	**Wt.%**	**60.1**	**-**	**-**	**32.2**	**2.5**	**1.6**	**-**	**1.8**	**-**	**98.2**
			F. c.	0.98	-	-	0.88	0.08	0.04	-	0.02	-	2
248	75, 20	PdCu+BORN+CHC	**Wt.%**	**57.1**	**1.2**	**-**	**34.4**	**6.2**	**0.39**	**-**	**-**	**-**	**99.29**
			F. c.	0.89	0.01	-	0.90	0.19	0.01	-	-	-	2
249	75, 21	(Pd,Au)Cu+CHC+BORN	**Wt.%**	**53.2**	**-**	**7.4**	**33.0**	**0.89**	**0.78**	**2.2**	**2.2**	**-**	**99.67**
			F. c.	0.89	-	0.07	0.93	0.03	0.02	0.03	0.03	-	2
250	75, 22	PdCu	**Wt.%**	**62.2**	**-**	**-**	**29.2**	**5.0**	**1.8**	**1.1**	**-**	**-**	**99.3**
			F. c.	1.00	-	-	0.78	0.15	0.05	0.02	-	-	2
251	75, 23	(Pd,Pt)Cu+BORN	**Wt.%**	**56.6**	**5.2**	**-**	**29.3**	**7.0**	**0.77**	**-**	**-**	**-**	**98.87**
			F. c.	0.92	0.05	-	0.80	0.21	0.02	-	-	-	2
252	75, 24	PdCu+CHC+BORN+CHL	**Wt.%**	**57.5**	**4.2**	**-**	**30.2**	**5.6**	**1.9**	**-**	**-**	**-**	**99.4**
			F. c.	0.93	0.04	-	0.81	0.17	0.05	-	-	-	2
253	75, 26	PdCu+CHC+COPN	**Wt.%**	**56.1**	**-**	**1.3**	**38.3**	**1.4**	**1.3**	**-**	**0.82**	**-**	**99.22**
			F. c.	0.89	-	0.01	1.02	0.04	0.03	-	0.01	-	2
254	75, 27	PdCu (zone 1) +BORN	**Wt.%**	**56.1**	**-**	**-**	**40.6**	**2.1**	**-**	**-**	**-**	**-**	**98.8**
			F. c.	0.88	-	-	1.06	0.06	-	-	-	-	2
255	75, 27	PdCu (zone 2) +BORN	**Wt.%**	**62.3**	**-**	**-**	**29.6**	**1.6**	**0.53**	**4.3**	**-**	**1.5**	**99.83**
			F. c.	1.04	-	-	0.83	0.05	0.01	0.06	-	0.01	2
256	75, 28	(Pd,Au)Cu+BORN	**Wt.%**	**56.6**	**-**	**7.2**	**29.9**	**2.5**	**2.4**	**-**	**1.3**	**-**	**99.9**
			F. c.	0.94	-	0.06	0.83	0.08	0.07	-	0.02	-	2
257	75, 30	PdCu	**Wt.%**	**61.8**	**-**	**-**	**29.8**	**5.2**	**1.8**	**1.0**	**-**	**-**	**99.6**
			F. c.	0.99	-	-	0.79	0.16	0.05	0.01	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
258	75, 31	PdCu+OPX+ILM	**Wt.%**	**61.9**	**-**	**-**	**30.0**	**4.4**	**2.8**	**-**	**-**	**-**	**99.1**
			F. c.	0.99	-	-	0.80	0.13	0.07	-	-	-	2
259	75, 32	PdCu+CHC+MT	**Wt.%**	**62.4**	**-**	**-**	**29.4**	**2.2**	**1.0**	**4.0**	**-**	**-**	**99.0**
			F. c.	1.00	-	-	0.81	0.07	0.03	0.06	-	-	2
260	75, 33	PdCu+CP	**Wt.%**	**62.7**	**-**	**-**	**27.7**	**5.4**	**2.4**	**-**	**-**	**-**	**98.2**
			F. c.	1.02	-	-	0.75	0.17	0.06	-	-	-	2
261	75, 34	PdCu+(Pd,Cu,Sn)+BORN	**Wt.%**	**60.4**	**-**	**-**	**29.1**	**3.5**	**1.0**	**3.1**	**-**	**1.4**	**98.5**
			F. c.	1.00	-	-	0.81	0.11	0.03	0.05	-	0.01	2
262	75, 35	PdCu+BORN	**Wt.%**	**61.6**	**-**	**-**	**32.5**	**3.4**	**1.7**	**-**	**-**	**-**	**99.2**
			F. c.	0.98	-	-	0.87	0.10	0.05	-	-	-	2
263	75, 36	PdCu+BORN	**Wt.%**	**62.6**	**-**	**-**	**28.8**	**6.0**	**1.8**	**-**	**-**	**-**	**99.2**
			F. c.	1.00	-	-	0.77	0.18	0.05	-	-	-	2
264	75, 37	PdCu+BORN+CHC	**Wt.%**	**61.4**	**-**	**-**	**28.6**	**4.9**	**2.9**	**-**	**-**	**1.2**	**99.0**
			F. c.	0.99	-	-	0.77	0.15	0.08	-	-	0.01	2
265	75, 38	PdCu+(Pd,Cu,Sn)+BORN	**Wt.%**	**61.9**	**-**	**-**	**29.1**	**4.3**	**1.5**	**1.6**	**-**	**-**	**98.4**
			F. c.	1.01	-	-	0.80	0.13	0.04	0.02	-	-	2
266	75, 39	(Pd,Au)Cu+KTH+CHC+BORN	**Wt.%**	**42.4**	**1.2**	**22.4**	**31.4**	**0.48**	**1.2**	**-**	**0.76**	**-**	**99.84**
			F. c.	0.76	0.01	0.22	0.95	0.02	0.03	-	0.01	-	2
267	75, 40	PdCu+CHC+BORN	**Wt.%**	**62.4**	**-**	**-**	**28.6**	**4.6**	**3.3**	**-**	**-**	**-**	**99.85**
			F. c.	1.00	-	-	0.77	0.14	0.09	-	-	-	2
268	75, 41	PdCu+BORN	**Wt.%**	**62.1**	**-**	**-**	**28.1**	**6.2**	**1.7**	**-**	**-**	**-**	**98.1**
			F. c.	1.00	-	-	0.76	0.19	0.05	-	-	-	2
269	75, 42	PdCu+CHC+BORN	**Wt.%**	**60.3**	**-**	**-**	**33.3**	**2.2**	**2.1**	**1.0**	**-**	**-**	**98.9**
			F. c.	0.97	-	-	0.90	0.07	0.05	0.01	-	-	2
270	75, 43	PdCu+CHC+BORN	**Wt.%**	**61.8**	**-**	**-**	**29.8**	**4.7**	**2.1**	**-**	**-**	**-**	**98.4**
			F. c.	1.00	-	-	0.81	0.14	0.05	-	-	-	2
271	75, 44	PdCu	**Wt.%**	**61.2**	**-**	**1.5**	**28.8**	**3.9**	**1.6**	**1.7**	**-**	**-**	**98.7**
			F. c.	1.01	-	0.01	0.79	0.12	0.04	0.03	-	-	2
272	75, 45	PdCu	**Wt.%**	**62.0**	**-**	**-**	**29.0**	**5.8**	**1.7**	**1.4**	**-**	**-**	**99.9**
			F. c.	0.99	-	-	0.77	0.18	0.04	0.02	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
273	75, 46	PdCu+CHC	**Wt.%**	**61.5**	**-**	**-**	**31.4**	**2.5**	**0.95**	**2.3**	**-**	**-**	**98.65**
			F. c.	1.00	-	-	0.86	0.08	0.03	0.03	-	-	2
274	75, 47	PdCu+BORN+MT	**Wt.%**	**63.1**	**-**	**-**	**27.3**	**5.5**	**2.0**	**1.2**	**-**	**-**	**99.1**
			F. c.	1.02	-	-	0.74	0.17	0.05	0.02	-	-	2
275	75, 48	PdCu+BORN	**Wt.%**	**62.0**	**-**	**-**	**28.8**	**5.5**	**1.9**	**0.71**	**-**	**-**	**98.91**
			F. c.	0.99	-	-	0.78	0.17	0.05	0.01	-	-	2
276	75, 49	PdCu+BORN+DGN+HB	**Wt.%**	**61.3**	**2.7**	**-**	**30.0**	**5.1**	**1.7**	**-**	**-**	**-**	**100.8**
			F. c.	0.98	0.02	-	0.80	0.16	0.04	-	-	-	2
277	75, 50	PdCu+BORN+MT	**Wt.%**	**63.0**	**-**	**-**	**31.3**	**1.9**	**1.0**	**3.6**	**-**	**1.4**	**102.2**
			F. c.	1.01	-	-	0.84	0.06	0.03	0.05	-	0.01	2
278	75, 51	PdCu+CHC	**Wt.%**	**63.6**	**-**	**-**	**29.9**	**3.8**	**3.7**	**-**	**-**	**-**	**101.0**
			F. c.	1.00	-	-	0.79	0.12	0.09	-	-	-	2
279	75, 52	PdCu	**Wt.%**	**64.1**	**-**	**-**	**29.8**	**4.7**	**2.0**	**-**	**-**	**1.0**	**101.6**
			F. c.	1.01	-	-	0.79	0.14	0.05	-	-	0.01	2
280	75, 53	PdCu+BORN	**Wt.%**	**62.6**	**-**	**-**	**29.3**	**3.1**	**1.5**	**3.3**	**-**	**-**	**99.8**
			F. c.	1.02	-	-	0.80	0.09	0.04	0.05	-	-	2
281	75, 54	PdCu+BORN+DGN+ILM	**Wt.%**	**59.0**	**1.0**	**-**	**34.3**	**4.9**	**-**	**-**	**-**	**-**	**99.2**
			F. c.	0.93	0.01	-	0.91	0.15	-	-	-	-	2
282	75, 55	PdCu+BORN+ILM	**Wt.%**	**63.0**	**-**	**-**	**27.5**	**5.4**	**2.7**	-	-	-	**98.6**
			F. c.	1.02	-	-	0.75	0.16	0.07	-	-	-	2
283	75, 56	PdCu+BORN	**Wt.%**	**63.2**	**-**	**-**	**27.1**	**5.8**	**2.3**	**-**	**-**	**-**	**98.4**
			F. c.	1.02	-	-	0.74	0.18	0.06	-	-	-	2
284	75, 57	PdCu+BORN+CHC	**Wt.%**	**61.9**	**-**	**1.1**	**27.7**	**4.2**	**2.7**	**0.74**	**0.72**	**-**	**99.06**
			F. c.	1.01	-	0.01	0.76	0.13	0.07	0.01	0.01	-	2
285	75, 58	PdCu+BORN+CHC	**Wt.%**	**62.3**	**-**	**-**	**30.2**	**3.9**	**1.5**	**0.9**	**-**	**-**	**98.8**
			F. c.	1.01	-	-	0.82	0.12	0.04	0.01	-	-	2
286	75, 60	PdCu+CHC+BORN	**Wt.%**	**61.9**	**-**	**1.8**	**28.6**	**4.1**	**3.1**	**-**	**-**	**-**	**99.5**
			F. c.	1.00	-	0.02	0.77	0.13	0.08	-	-	-	2
287	75, 61	PdCu+CHC+BORN	**Wt.%**	**62.9**	**-**	**-**	**31.3**	**3.0**	**2.3**	**-**	**-**	**-**	**99.5**
			F. c.	1.01	-	-	0.84	0.09	0.06	-	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
288	75, 62	PdCu	**Wt.%**	**62.9**	**-**	**-**	**29.5**	**3.0**	**1.0**	**2.6**	**-**	**-**	**99.0**
			F. c.	1.03	-	-	0.81	0.09	0.03	0.04	-	-	2
289	75, 63	PdCu+BORN	**Wt.%**	**62.7**	**-**	**-**	**28.7**	**4.5**	**1.9**	**1.3**	**-**	**-**	**99.1**
			F. c.	1.01	-	-	0.78	0.14	0.05	0.02	-	-	2
290	75, 64	PdCu+BORN	**Wt.%**	**63.4**	**-**	**-**	**27.9**	**6.1**	**2.1**	**-**	**-**	**-**	**99.5**
			F. c.	1.01	-	-	0.75	0.19	0.05	-	-	-	2
291	75, 65	(Pd,Pt)Cu+BORN+CHC	**Wt.%**	**55.7**	**7.9**	**-**	**29.2**	**6.1**	**1.0**	**-**	**-**	**-**	**99.9**
			F. c.	0.91	0.07	-	0.80	0.19	0.03	-	-	-	2
292	75, 66	PdCu+BORN	**Wt.%**	**61.7**	**-**	**1.1**	**28.4**	**4.1**	**2.0**	**1.7**	**-**	**-**	**99.0**
			F. c.	1.01	-	0.01	0.78	0.13	0.05	0.02	-	-	2
293	75, 67	PdCu+BORN	**Wt.%**	**62.4**	**-**	**-**	**28.9**	**4.5**	**1.6**	**2.5**	**-**	**-**	**99.9**
			F. c.	1.00	-	-	0.78	0.14	0.04	0.04	-	-	2
294	75, 68	PdCu+BORN	**Wt.%**	**60.4**	**-**	**-**	**30.4**	**1.3**	**0.68**	**6.7**	**-**	**-**	**99.48**
			F. c.	1.00	-	-	0.84	0.04	0.02	0.10	-	-	2
295	75, 69	PdCu+BORN+CHC	**Wt.%**	**61.1**	**1.8**	**-**	**28.2**	**3.1**	**1.8**	**1.2**	**-**	**1.9**	**99.6**
			F. c.	1.01	0.02	-	0.79	0.10	0.05	0.02	-	0.01	2
296	75, 70	CHC	**Wt.%**	**60.1**	**2.1**	**-**	**31.7**	**4.0**	**1.5**	**-**	**-**	**-**	**99.4**
			F. c.	0.97	0.02	-	0.85	0.12	0.04	-	-	-	2
297	75, 71	PdCu+BORN+CHC+MT	**Wt.%**	**63.0**	**-**	**-**	**28.6**	**4.3**	**3.2**	**-**	**-**	**-**	**99.1**
			F. c.	1.01	-	-	0.78	0.13	0.8	-	-	-	2
298	75, 72	Pd(Cu,Sn)+$PdCu_3$(Pd,Cu,Sn)+CHC	**Wt.%**	**57.5**	**-**	**-**	**30.8**	**0.37**	**0.77**	**9.9**	**-**	**-**	**99.34**
			F. c.	0.96	-	-	0.86	0.01	0.02	0.15	-	-	3
299	75, 73	PdCu+BORN+CHC	**Wt.%**	**62.9**	**-**	**-**	**30.3**	**3.5**	**1.3**	**1.3**	**-**	**-**	**99.3**
			F. c.	1.02	-	-	0.82	0.11	0.03	0.02	-	-	2
300	75, 74	PdCu+BORN+CHC	**Wt.%**	**62.6**	**-**	**1.2**	**28.0**	**4.0**	**3.6**	**-**	**-**	**-**	**99.4**
			F. c.	1.01	-	0.01	0.76	0.13	0.09	-	-	-	2
301	75, 75	PdCu+CP+BORN	**Wt.%**	**63.6**	**-**	**-**	**27.2**	**5.7**	**2.3**	**-**	**-**	**-**	**98.8**
			F. c.	1.03	-	-	0.73	0.18	0.06	-	-	-	2
302	75, 76	PdCu+BORN	**Wt.%**	**63.2**	**-**	**-**	**27.6**	**6.5**	**1.9**	**-**	**-**	**-**	**99.2**
			F. c.	1.01	-	-	0.74	0.20	0.05	-	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
303	75, 77	PdCu	**Wt.%**	**63.2**	**-**	**-**	**27.9**	**6.3**	**1.8**	**-**	**-**	**-**	**99.2**
			F. c.	1.01	-	-	0.75	0.19	0.05	-	-	-	2
304	75, 78	PdCu+MT	**Wt.%**	**63.1**	**-**	**-**	**28.0**	**5.4**	**2.1**	**-**	**-**	**-**	**98.6**
			F. c.	1.02	-	-	0.76	0.17	0.05	-	-	-	2
305	75, 79	PdCu+BORN+MT	**Wt.%**	**62.0**	**-**	**1.0**	**29.4**	**2.8**	**1.3**	**2.7**	**-**	**-**	**99.2**
			F. c.	1.02	-	0.01	0.81	0.09	0.03	0.4	-	-	2
306	75, 80	PdCu	**Wt.%**	**63.7**	**-**	**-**	**28.7**	**5.8**	**0.70**	**-**	**-**	**-**	**98.9**
			F. c.	1.03	-	-	0.77	0.18	0.02	-	-	-	2
307	75, 82	PdCu+DGN	**Wt.%**	**63.3**	**-**	**-**	**28.7**	**5.7**	**2.1**	**-**	**-**	**-**	**99.8**
			F. c.	1.01	-	-	0.76	0.17	0.06	-	-	-	2
308	125-1, 2	PdCu+BORN+CHC	**Wt.%**	**63.7**	**-**	**-**	**26.5**	**4.4**	**3.3**	**-**	**-**	**-**	**98.0**
			F. c.	1.04	-	-	0.73	0.14	0.09	-	-	-	2
309	125-1, 3	PdCu+BORN+MT	**Wt.%**	**63.8**	**-**	**-**	**28.6**	**3.7**	**2.8**	**-**	**-**	**-**	**98.9**
			F. c.	1.03	-	-	0.78	0.12	0.07	-	-	-	2
310	125-1, 4	PdCu	**Wt.%**	**62.6**	**-**	**1.2**	**28.0**	**4.6**	**1.9**	**1.1**	**-**	**-**	**99.4**
			F. c.	1.02	-	0.01	0.76	0.14	0.05	0.02	-	-	2
311	125-1, 5	PdCu+BORN+CHC+MT	**Wt.%**	**62.6**	**-**	**1.7**	**27.6**	**4.6**	**3.3**	**-**	**-**	**-**	**99.8**
			F. c.	1.01	-	0.01	0.75	0.14	0.09	-	-	-	2
312	125-1, 6	PdCu+BORN+CHC	**Wt.%**	**63.6**	**-**	**-**	**28.4**	**4.0**	**3.0**	**-**	**-**	**-**	**99.0**
			F. c.	1.03	-	-	0.77	0.12	0.08	-	-	-	2
313	125-1, 7	PdCu+BORN+CHC	**Wt.%**	**61.3**	**-**	**2.1**	**28.4**	**3.5**	**4.4**	**-**	**-**	**-**	**99.7**
			F. c.	0.99	-	0.02	0.77	0.11	0.12	-	-	-	2
314	125-1, 9	(Pd,Pt)Cu+CHC+BORNPL+EP	**Wt.%**	**54.7**	**10.0**		**27.9**	**6.3**	**0.68**	**-**	**-**	**-**	**99.58**
			F. c.	0.91	0.09		0.78	0.20	0.02	-	-	-	2
315	125-1, 10	(Pd,Au)Cu+CHC+BORN	**Wt.%**	**52.2**	**-**	**11.3**	**28.9**	**2.0**	**2.6**	**-**	**1.7**	**-**	**98.7**
			F. c.	0.90	-	0.11	0.83	0.07	0.07	-	0.02	-	2
316	125-1, 11	PdCu+BORN+CHC+MT	**Wt.%**	**61.9**	**-**	**1.0**	**28.6**	**7.1**	**0.74**	**-**	**-**	**-**	**99.34**
			F. c.	0.99	-	0.01	0.77	0.21	0.02	-	-	-	2
317	125-1, 13	PdCu+BORN	**Wt.%**	**63.2**	**-**	**-**	**28.8**	**4.9**	**2.1**	**-**	**-**	**-**	**99.0**
			F. c.	1.02	-	-	0.78	0.15	0.05	-	-	-	2

Table 4 continued. *Chemical composition and formulas of the unnamed mineral phase PdCu in PGM-grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain		Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb	Total
318	125-1, 14	PdCu+CHC	**Wt.%**	**62.6**	**-**	**-**	**29.4**	**4.7**	**1.7**	**0.9**	**-**	**-**	**99.3**
			F. c.	1.01	-	-	0.79	0.14	0.05	0.01	-	-	2
319	125-2, 2	PdCu+BORN	**Wt.%**	**64.2**	**-**	**-**	**28.0**	**7.1**	**0.50**	**-**	**-**	**-**	**99.8**
			F. c.	1.02	-	-	0.75	0.22	0.01	-	-	-	2
320	125-2, 3	PdCu (zone 1)+BORN	**Wt.%**	**61.5**	**-**	**-**	**29.9**	**0.33**	**1.4**	**1.7**	**-**	**3.9**	**98.73**
			F. c.	1.04	-	-	0.85	0.01	0.04	0.03	-	0.03	2
321	125-2, 3	PdCu (zone 2)+BORN	**Wt.%**	**62.8**	**-**	**-**	**29.7**	**4.3**	**1.0**	**-**	**-**	**1.5**	**99.3**
			F. c.	1.02	-	-	0.81	0.13	0.03	-	-	0.01	2
322	125-2, 4	PdCu+BORN+CHC+BT	**Wt.%**	**55.0**	**-**	**1.0**	**41.4**	**0.82**	**1.5**	**-**	**-**	**-**	**99.72**
			F. c.	0.85	-	0.01	1.08	0.02	0.04	-	-	-	2
323	125-2, 5	PdCu+CHC+BORN	**Wt.%**	**60.1**	**1.3**	**-**	**30.3**	**0.80**	**0.82**	**3.8**	**-**	**1.9**	**99.02**
			F. c.	1.01	0.01	-	0.85	0.03	0.02	0.06	-	0.02	2
324	125-2, 6	PdCu+CHC+BORN+OPX+BT+ACT	**Wt.%**	**61.3**	**-**	**2.6**	**27.0**	**4.5**	**3.3**	**-**	**0.81**	**-**	**99.51**
			F. c.	1.00	-	0.02	0.74	0.14	0.09	-	0.01	-	2
325	125-2, 7	PdCu+BORN+CHC+MT	**Wt.%**	**61.6**	**-**	**1.0**	**30.3**	**3.6**	**2.6**	**-**	**-**	**-**	**99.1**
			F. c.	0.99	-	0.01	0.82	0.11	0.07	-	-	-	2
326	125-2, 8	PdCu+BORN	**Wt.%**	**63.5**	**-**	**-**	**28.7**	**6.0**	**1.7**	**-**	**-**	**-**	**99.9**
			F. c.	1.01	-	-	0.77	0.18	0.04	-	-	-	2

Table 5. *Chemical composition and formulas of unnamed mineral phase $PdCu_3$, alloys of Pd and Cu, alloy (Pd,Cu,Sn), keithconnite, vasilite, zvyagintsevite, tetraferroplatinum, hongshiite and unnamed mineral phase $(Pt,Pd)Cu_3$ in precious metal grains of the heavy concentrates (sample 90-24, 1057) of the sample 90-24, 1057*

An.	Grain	Association of minerals in the grain	Mineral		Pd	Pt	Au	Cu	Fe	Sn	Te	Pb	S	Total
1	45-1, 4	$PdCu_3$+Pd(Cu,Sn)+CHC+ BORN	$PdCu_3$	**Wt.%**	**31.1**	**5.0**	**-**	**64.8**	**0.7**	**-**	**-**	**-**	**-**	**101.6**
				F. c.	0.87	0.07	-	3.02	0.04	-	-	-	-	4
2	45-1, 68	$PdCu_3$+DGN	$PdCu_3$	**Wt.%**	**34.7**	**3.7**	**-**	**0.9**	**0.8**	**-**	**-**	**-**	**-**	**99.4**
				F. c.	1.00	0.05	-	2.90	0.05	-	-	-	-	4
3	45-1, 82	$PdCu_3$+CHC	$PdCu_3$	**Wt.%**	**26.0**	**2.7**	**1.2**	**68.4**	**0.7**	**-**	**-**	**-**	**-**	**99.0**
				F. c.	0.72	0.04	0.02	3.18	0.04	-	-	-	-	4
4	45-1, 124	$PdCu_3$+PdCu+BORN	$PdCu_3$	**Wt.%**	**30.7**	**4.7**	**-**	**63.2**	**0.6**	**-**	**-**	**-**	**-**	**99.2**
				F. c.	0.88	0.07	-	3.02	0.03	-	-	-	-	4
5	45-1, 144	$PdCu_3$+PdCu+CHC+BORN	$PdCu_3$	**Wt.%**	**25.2**	**12.1**	**-**	**58.5**	**0.7**	**-**	**-**	**1.9**	**-**	**98.4**
				F. c.	0.76	0.20	-	2.97	0.04	-	-	0.03	-	4
6	45-1, 191	$PdCu_3$+PdCu+CHC	$PdCu_3$	**Wt.%**	**34.7**	**1.1**	**3.1**	**60.2**	**-**	**-**	**-**	**-**	**-**	**99.1**
				F. c.	1.01	0.01	0.05	2.93	-	-	-	-	-	4
7	45-2, 15	$(Pd,Au)Cu_3$+(Pd,Au)Cu+ CHC+BORN	$(Pd,Au)Cu_3$	**Wt.%**	**21.7**	**1.8**	**18.0**	**57.4**	**0.76**	**-**	**-**	**-**	**-**	**99.76**
				F. c.	0.67	0.03	0.30	2.96	0.04	-	-	-	-	4
8	45-2, 42	$(Pd,Au)Cu_3$+(Pd,Au)Cu	$(Pd,Au)Cu_3$	**Wt.%**	**23.3**	**2.8**	**18.4**	**54.3**	**0.67**	**-**	**-**	**-**	**-**	**99.47**
				F. c.	0.74	0.05	0.31	2.86	0.04	-	-	-	-	4
9	75, 11	$PdCu_3$+(Pd,Cu,Sn)	$PdCu_3$	**Wt.%**	**30.7**	**-**	**-**	**68.3**	**0.49**	**-**	**-**	**-**	**-**	**99.49**
				F. c.	0.84	-	-	3.13	0.03	-	-	-	-	4
10	75, 72	$PdCu_3$+(Pd,Cu,Sn)+CHC	$PdCu_3$	**Wt.%**	**34.1**	**-**	**-**	**63.4**	**1.1**	**-**	**-**	**-**	**-**	**98.6**
				F. c.	0.95	-	-	2.98	0.06	-	-	-	-	4
11	125-1, 12	$PdCu_3$+CHC+BORN	$PdCu_3$	**Wt.%**	**36.3**	**-**	**-**	**63.2**	**-**	**-**	**-**	**-**	**-**	**99.5**
				F. c.	1.02	-	-	2.98	-	-	-	-	-	4
12	45-1, 84	(Cu,Pd)+CHC	(Cu,Pd)	**Wt.%**	**19.6**	**-**	**-**	**78.8**	**0.5**	**-**	**-**	**-**	**-**	**98.9**
				F. c.	0.13	-	-	0.86	0.01	-	-	-	-	1
13	45-1, 133	(Cu,Pd)+CHC	(Cu,Pd)	**Wt.%**	**26.0**	**-**	**-**	**71.5**	**1.1**	**-**	**-**	**-**	**-**	**98.6**
				F. c.	0.18	-	-	0.81	0.01	-	-	-	-	1
14	45-1, 141	(Cu,Pd)+DGN	(Cu,Pd)	**Wt.%**	**53.7**	**-**	**-**	**44.4**	**1.4**	**-**	**-**	**-**	**-**	**99.5**
				F. c.	0.41	-	-	0.57	0.02	-	-	-	-	1

Table 5 continued. *Chemical composition and formulas of unnamed mineral phase $PdCu_3$, alloys of Pd and Cu, alloy (Pd,Cu,Sn), keithconnite, vasilite, zvyagintsevite, tetraferroplatinum, hongshiite and unnamed mineral phase $(Pt,Pd)Cu_3$ in precious metal grains of the heavy concentrates (sample 90-24, 1057) of the sample 90-24, 1057*

An.	Grain	Association of minerals in the grain	Mineral		Pd	Pt	Au	Cu	Fe	Sn	Te	Pb	S	Total
15	45-1, 8	(Pd,Sn,Cu)+PdCu	(Pd,Sn,Cu)	**Wt.%**	**65.8**	**-**	**-**	**10.8**	**-**	**21.6**	**-**	**-**	**-**	**98.2**
				F. c.	0.64	-	-	0.17	-	0.19	-	-	-	1
16	45-1, 14	(Pd,Cu,Sn)+PdCu+BORN	(Pd,Cu,Sn)	**Wt.%**	**67.5**	**1.5**	**0.9**	**13.2**	**0.9**	**15.5**	**-**	**1.4**	**-**	**100.0**
				F. c.	0.64	0.01	-	0.21	0.02	0.15	-	0.01	-	1
17	45-1, 17	(Pd,Cu,Sn)+PdCu+BORN +MT	(Pd,Cu,Sn)	**Wt.%**	**65.0**	**-**	**-**	**13.3**	**2.3**	**17.4**	**-**	**-**	**-**	**98.0**
				F. c.	0.61	-	-	0.21	0.04	0.14	-	-	-	1
18	45-1, 25	(Pd,Sn,Cu)+PdCu	(Pd,Sn,Cu)	**Wt.%**	**67.6**	**-**	**-**	**10.8**	-	**20.9**	**-**	**-**	**-**	**99.3**
				F. c.	0.65	-	-	0.17	-	0.18	-	-	-	1
19	45-1, 29	(Pd,Cu,Sn)+PdCu	(Pd,Cu,Sn)	**Wt.%**	**62.5**	**1.1**	**1.0**	**21.4**	**0.7**	**11.5**	**-**	**1.5**	**-**	**99.7**
				F. c.	0.56-	0.01	-	0.32	0.01	0.09	-	0.01	-	1
20	45-1, 80	(Pd,Cu,Sn)+PdCu+MT	(Pd,Cu,Sn)	**Wt.%**	**66.6**	**-**	**-**	**10.7**	**0.7**	**20.7**	**-**	**-**	**-**	**98.7**
				F. c.	0.64	-	-	0.17	0.01	0.18	-	-	-	1
21	45-1, 111	(Pd,Cu,Sn)+PdCu+BORN	(Pd,Cu,Sn)	**Wt.%**	**67.8**	**-**	**-**	**12.3**	**-**	**19.2**	**-**	**-**	**-**	**99.3**
				F. c.	0.64	-	-	0.20	-	0.16	-	-	-	1
22	45-1, 139	(Pd,Sn,Cu)+PdCu+ BORN	(Pd,Sn,Cu)	**Wt.%**	**66.8**	**-**	**-**	**12.0**	**0.7**	**19.1**	**-**	**-**	**-**	**98.6**
				F. c.	0.64	-	-	0.19	0.01	0.16	-	-	-	1
23	45-1, 165	(Pd,Cu,Sn)+TFP +BORN+CHC+MT	(Pd,Cu,Sn)	**Wt.%**	**56.5**	**4.9**	**-**	**12.8**	**0.56**	**23.2**	**-**	**-**	**-**	**98.26**
				F. c.	0.55	0.03	-	0.21	0.01	0.21	-	-	-	1
24	45-2, 5	(Pd,Cu,Sn)+PdCu+ BORN	(Pd,Cu,Sn)	**Wt.%**	**67.2**		**-**	**13.0**	**-**	**18.9**	**-**	**-**	**-**	**99.1**
				F. c.	0.64		-	0.20	-	0.16	-	-	-	1
25	45-2, 12	(Pd,Cu,Sn)+Pd(Cu,Sn)	(Pd,Cu,Sn)	**Wt.%**	**65.7**	**1.6**	**1.7**	**11.5**	**0.78**	**16.9**	**-**	**1.6**	**-**	**99.78**
				F. c.	0.63	0.01	0.01	0.18	0.01	0.15	-	0.01	-	1
26	75, 34	(Pd,Cu,Sn)+PdCu+BORN	(Pd,Cu,Sn)	**Wt.%**	**68.4**	**-**	**-**	**10.3**	**-**	**19.1**	**-**	**1.0**	**-**	**98.8**
				F. c.	0.66	-	-	0.17	-	0.17	-	0.01	-	1
27	p.s.,	KTH+BORN+PL	KTH	**Wt.%**	**70.9**	**-**	**-**	**-**	**0.48**	**1.2**	**27.2**	**-**	**-**	**99.78**
				F. c.	2.97	-	-	-	0.04	0.05	0.95	-	-	4

Table 5 continued. *Chemical composition and formulas of unnamed mineral phase $PdCu_3$, alloys of Pd and Cu, alloy (Pd,Cu,Sn), keithconnite, vasilite, zvyagintsevite, tetraferroplatinum, hongshiite and unnamed mineral phase $(Pt,Pd)Cu_3$ in precious metal grains of the heavy concentrates (sample 90-24, 1057) of the sample 90-24, 1057*

An.	Grain	Association of minerals in the grain	Mineral		Pd	Pt	Au	Cu	Fe	Sn	Te	Pb	S	Total
28	45-1, 34	KTH+PdCu+VSL+MT	KTH	**Wt.%**	**67.7**	**-**	**-**	**1.4**	**0.49**	**-**	**28.3**	**0.9**	**-**	**98.7**
				F. c.	2.85	-	-	0.10	0.04	-	0.99	0.02	-	4
29	45-1, 53	KTH+PdCu	KTH	**Wt.%**	**68.6**	**-**	**-**	**0.5**	**0.5**	**-**	**28.8**	**-**	**-**	**98.4**
				F. c.	2.91	-	-	0.03	0.04	-	1.02	-	-	4
30	45-1, 59	KTH+PdCu	KTH	**Wt.%**	**68.9**	**-**	**-**	**0.51**	**0.49**	**-**	**29.0**	**-**	**-**	**98.9**
				F. c.	2.90	-	-	0.04	0.04	-	1.02	-	-	4
31	45-1, 113	KTH+PdCu+CHC+ANC	KTH	**Wt.%**	**69.6**	**-**	**-**	**0.5**	**0.3**	**1.4**	**27.1**	**1.0**	**-**	**99.9**
				F. c.	2.92	-	-	0.04	0.03	0.05	0.94	0.02	-	4
32	45-1, 117	KTH+PdCu+$PdAuCu_2$+ BORN	KTH	**Wt.%**	**69.8**	**-**	**-**	**2.6**	**0.3**	**2.7**	**24.7**	**-**	**-**	**99.2**
				F. c.	2.84	-	-	0.18	0.03	0.10	0.85	-	-	4
33	45-1, 158	KTH+PdCu+$PdAuCu_2$+ BORN	KTH	**Wt.%**	**68.7**	**-**	**-**	**0.7**	**0.6**	**3.1**	**25.8**	**-**	**-**	**99.9**
				F. c.	2.89	-	-	0.05	0.05	0.11	0.90	-	-	4
34	45-1, 172	KTH+$PdAuCu_2$+CHC	KTH	**Wt.%**	**73.3**	**-**	**-**			**4.8**	**13.5**	**7.9**	**-**	**99.5**
				F. c.	3.15	-	-			0.19	0.49	0.17	-	4
35	45-2, 61	KTH+PdCu+CHC+BORN	KTH	**Wt.%**	**66.6**	**-**	**-**	**4.3**	**0.85**	**-**	**28.3**	**-**	**-**	**100.05**
				F. c.	2.69	-	-	0.29	0.06	-	0.96	-	-	4
36	75, 39	KTH+PdCu+BORN+CHC	KTH	**Wt.%**	**70.3**	**-**	**-**	**1.0**	**0.42**	**-**	**28.1**	**-**	**-**	**99.82**
				F. c.	2.92	-	-	0.07	0.03	-	0.98	-	-	4
37	45-1, 34	VSL+PdCu+KTH+MT	VSL	**Wt.%**	**72.0**	**-**	**-**	**13.2**	**1.0**	**-**	**-**	**-**	**12.3**	**98.5**
				F. c.	12.10	-	-	3.70	0.32	-	-	-	6.88	23
38	45-1, 57	VSL+BORN+CHC	VSL	**Wt.%**	**63.6**	**-**	**-**	**20.5**	**2.5**	**-**	**-**	**-**	**13.2**	**99.8**
				F. c.	9.99	-	-	5.40	0.76	-	-	-	6.85	23
40	45-1, 122	VSL+PdCu+KTH	VSL	**Wt.%**	**72.9**	**-**		**13.1**	**1.4**	**-**	**-**	**-**	**12.1**	**99.5**
				F. c.	12.18	-		3.68	0.44	-	-	-	6.70	23
41	45-1, 50	VSL+$PdAuCu_2$	VSL	**Wt.%**	**69.9**	**-**	**2.4**	**14.2**	**0.53**	**-**	**-**	**-**	**12.0**	**99.03**
				F. c.	11.84	-	0.22	4.03	0.17	-	-	-	6.74	23
42	125-1, 15	VSL+CHC	VSL	**Wt.%**	**54.3**	**-**	**-**	**26.4**	**4.1**	**-**	**1.1**	**-**	**13.8**	**99.7**
				F. c.	8.16	-	-	6.63	1.18	-	0.14	-	6.89	23

Table 5 continued. *Chemical composition and formulas of unnamed mineral phase $PdCu_3$, alloys of Pd and Cu, alloy (Pd,Cu,Sn), keithconnite, vasilite, zvyagintsevite, tetraferroplatinum, hongshiite and unnamed mineral phase $(Pt,Pd)Cu_3$ in precious metal grains of the heavy concentrates (sample 90-24, 1057)*
of the sample 90-24, 1057

An.	Grain	Association of minerals in the grain	Mineral		Pd	Pt	Au	Cu	Fe	Sn	Te	Pb	S	Total
43	45-1, 81	ZV+PdCu+BORN+PN	ZV	**Wt.%**	**65.0**	**-**	**-**	**-**	**-**	**-**	**-**	**35.0**	**-**	**100.0**
				F. c.	3.13	-	-	-	-	-	-	0.87	-	4
44	45-1, 168	TFP+HNG+PdCu+BORN+ CHC	TFP	**Wt.%**	**9.4**	**61.8**	**-**	**7.2**	**21.6**	**-**	**-**	**-**	**-**	**100.0**
				F. c.	0.70	0.70	-	0.25	0.85	-	-	-	-	2
45	45-1, 168	TFP+HNG+PdCu+BORN+ CHC	HNG	**Wt.%**	**24.9**	**45.3**	**-**	**20.6**	**9.2**	**-**	**-**	**-**	**-**	**100.0**
				F. c.	0.49	0.49	-	0.68	0.34	-	-	-	-	2
46	45-1, 165	TFP+Pd(Cu,Sn)+BORN +CHC+MT	TFP	**Wt.%**	**1.5**	**70.8**	**-**	**11.0**	**16.6**	**-**	**-**	**-**	**-**	**99.9**
				F. c.	0.04	0.85	-	0.41	0.70	-	-	-	-	2
47	45-1, 137	$(Pt,Pd)Cu_3$+Pd(Cu,Sn)+ CHC+BORN	$(Pt,Pd)Cu_3$	**Wt.%**	**11.0**	**28.0**	**-**	**58.0**	**2.9**	**-**	**-**	**-**	**-**	**99.9**
				F. c.	0.34	0.47	-	3.02	0.17	-	-	-	-	4

Table 6. *Chemical composition and formulas of Au-minerals - unnamed mineral phase $PdAuCu_2$ and bogdanovite $(Au,Pd)_3Cu$, in precious metal mineral grains of the heavy concentrates (sample 90-24, 1057)*

An.	Grain	Association of minerals in the grain	Mineral		Au	Pd	Pt	Cu	Fe	Te	Total
1	45-1, 91	$PdAuCu_2$+(Pd,Au)Cu+ BORN	$PdAuCu_2$	**Wt.%**	**41.5**	**25.4**	**-**	**30.7**	**0.6**	**1.0**	**99.2**
				F. c.	0.89	1.00	-	2.03	0.05	0.03	4
2	45-1, 117	$PdAuCu_2$+(Pd,Au)Cu+ KTH+BORN	$PdAuCu_2$	**Wt.%**	**41.0**	**25.9**	**-**	**30.5**	**0.8**	**-**	**98.2**
				F. c.	0.88	1.03	-	2.03	0.06	-	4
3	45-1, 158	$PdAuCu_2$+(Pd,Au)Cu+KTH+ BORN	$PdAuCu_2$	**Wt.%**	**44.4**	**25.0**	**1.1**	**28.1**	**0.7**	**-**	**98.3**
				F. c.	0.98	1.02	0.03	1.92	0.05	-	4
4	45-1, 172	$PdAuCu_2$+KTH+CHC	$PdAuCu_2$	**Wt.%**	**45.8**	**21.2**	**2.4**	**29.6**	**0.63**	**-**	**99.63**
				F. c.	1.01	0.87	0.05	2.02	0.05	-	4
5	45-2, 34	$PdAuCu_2$+(Pd,Au)Cu	$PdAuCu_2$	**Wt.%**	**43.1**	**24.2**	**1.9**	**30.3**	**-**	**-**	**99.5**
				F. c.	0.94	0.97	0.04	2.05	-	-	4
6	45-2, 50	$PdAuCu_2$+VSL	$PdAuCu_2$	**Wt.%**	**41.8**	**25.8**	**2.1**	**28.5**	**0.84**	**1.0**	**100.4**
				F. c.	0.91	1.04	0.04	1.92	0.06	0.06	4
7	45-2, 65	$(Pd,Au)Cu_3$+(Pd,Au)Cu+ CHC+BORN	$PdAuCu_2$	**Wt.%**	**37.4**	**29.7**	**-**	**30.1**	**1.1**	**-**	**98.3**
				F. c.	0.79	1.16	-	1.97	0.08	-	4
8	75, 9	$(Pd,Au)Cu_3$+(Pd,Au)Cu+ BORN+OPX	$(Pd,Au)Cu_3$	**Wt.%**	**39.7**	**27.1**	**-**	**31.2**	**0.65**	**1.3**	**99.95**
				F. c.	0.83	1.05	-	2.03	0.05	0.04	4
9	45-1, 74	BGD+$PdAuCu_2$+CP	$PdAuCu_2$	**Wt.%**	**44.1**	**26.2**	**1.4**	**26.5**	**0.7**	**-**	**98.9**
				F. c.	0.99	1.08	0.03	1.84	0.06	-	4
10	45-1, 74	BGD+$PdAuCu_2$+CP	BGD	**Wt.%**	**60.3**	**25.3**	**-**	**13.1**	**0.9**	**-**	**99.6**
				F. c.	1.60	1.24	-	1.08	0.08	-	4

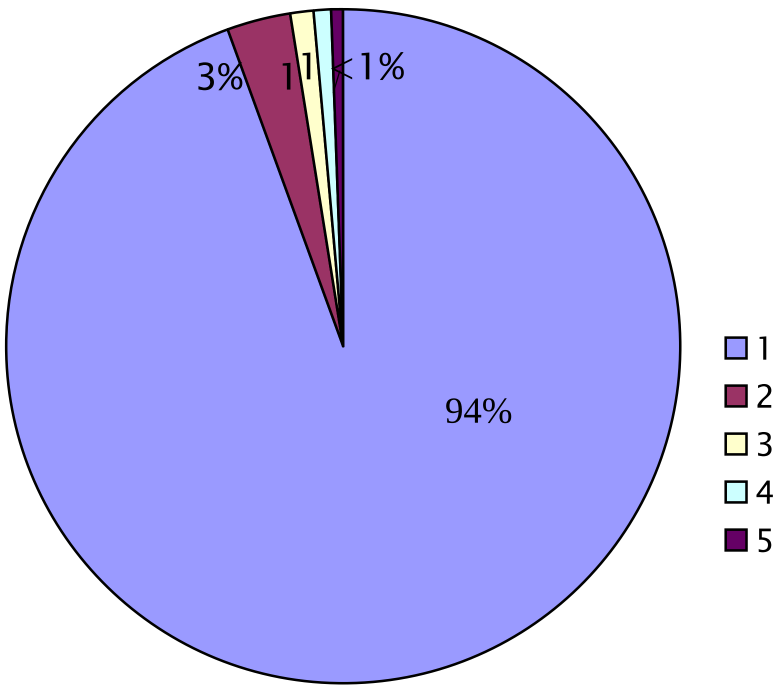

Fig.1. Relative contents of PGE - and Au-minerals, the sample 90-24, 1057.
1: PdCu mineral phase, 2: $PdCu_3$ mineral phase, 3: Au minerals ($PdAuCu_2$ mineral phase and bogdanovite), 4: alloy (Pd,Cu,Sn), 5: other PGMs (keithconnite, vasilite, alloys of Pt, Fe, Cu, Pd, zvyagintsevite).

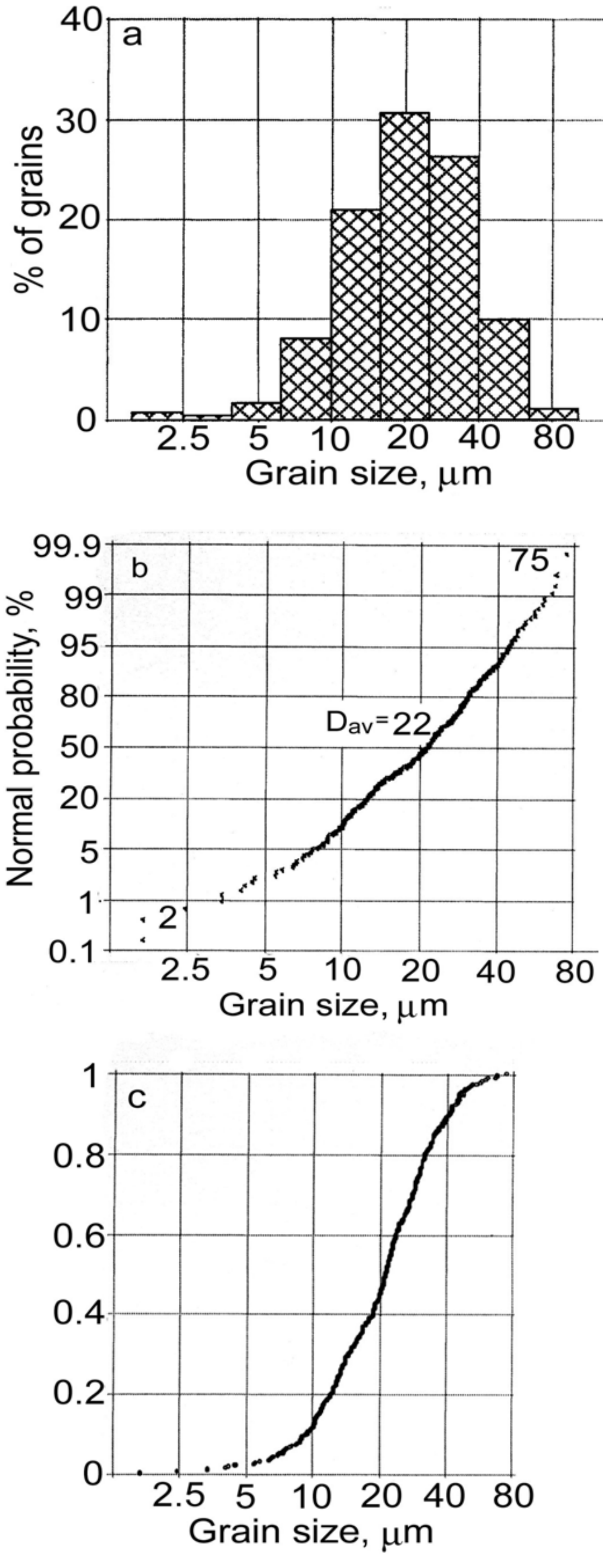

Fig. 2. Grain size of precious metal mineral grains (N=373), extracted in the heavy concentrates of the sample 90-24, 1057.
A: Histogram, B: Lognormal probability plot, C: Quantile plot.

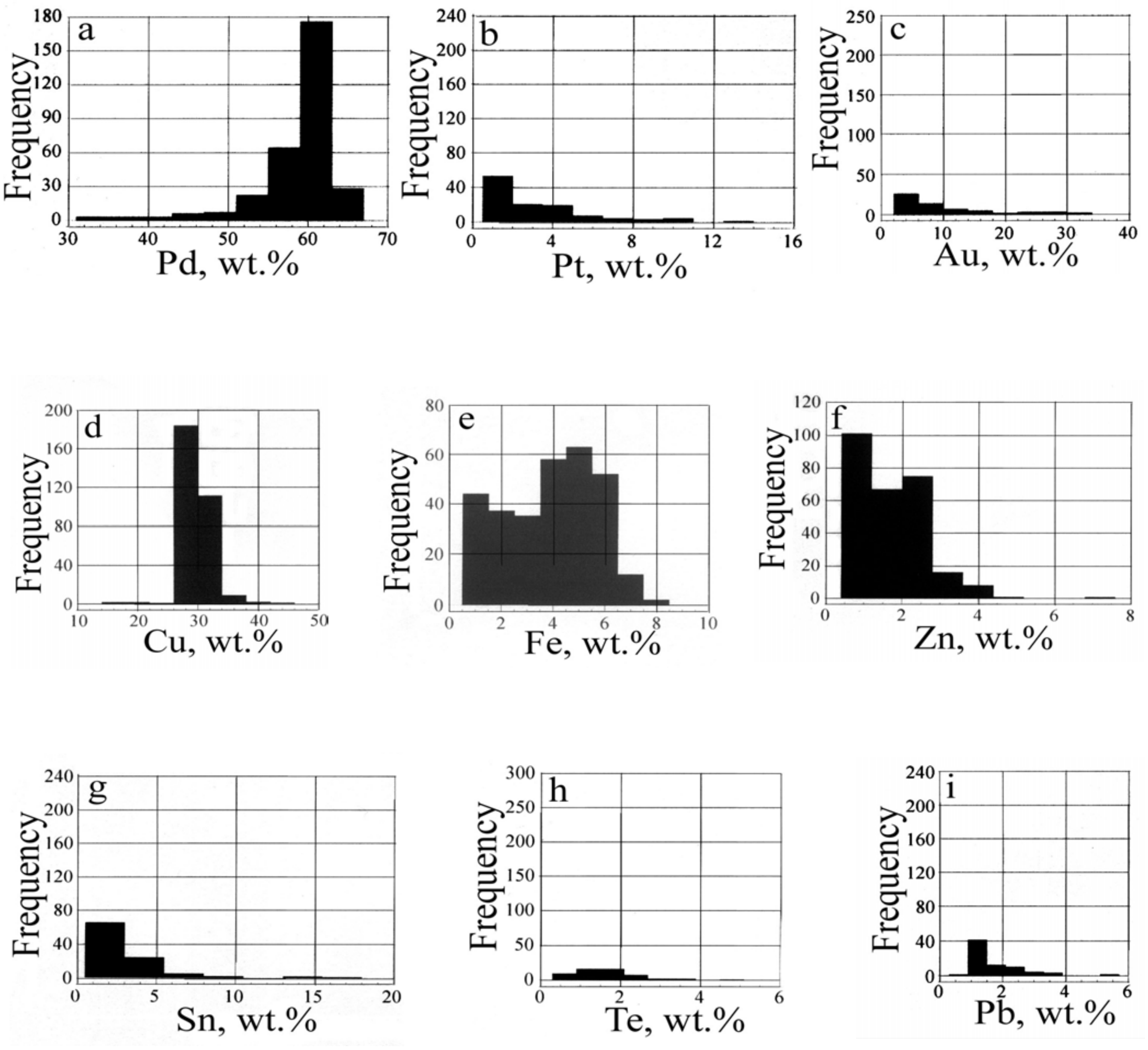

Fig. 3. Histograms of elements forming PdCu mineral phase, according to the Tabl. 4, n=326 (a-i).

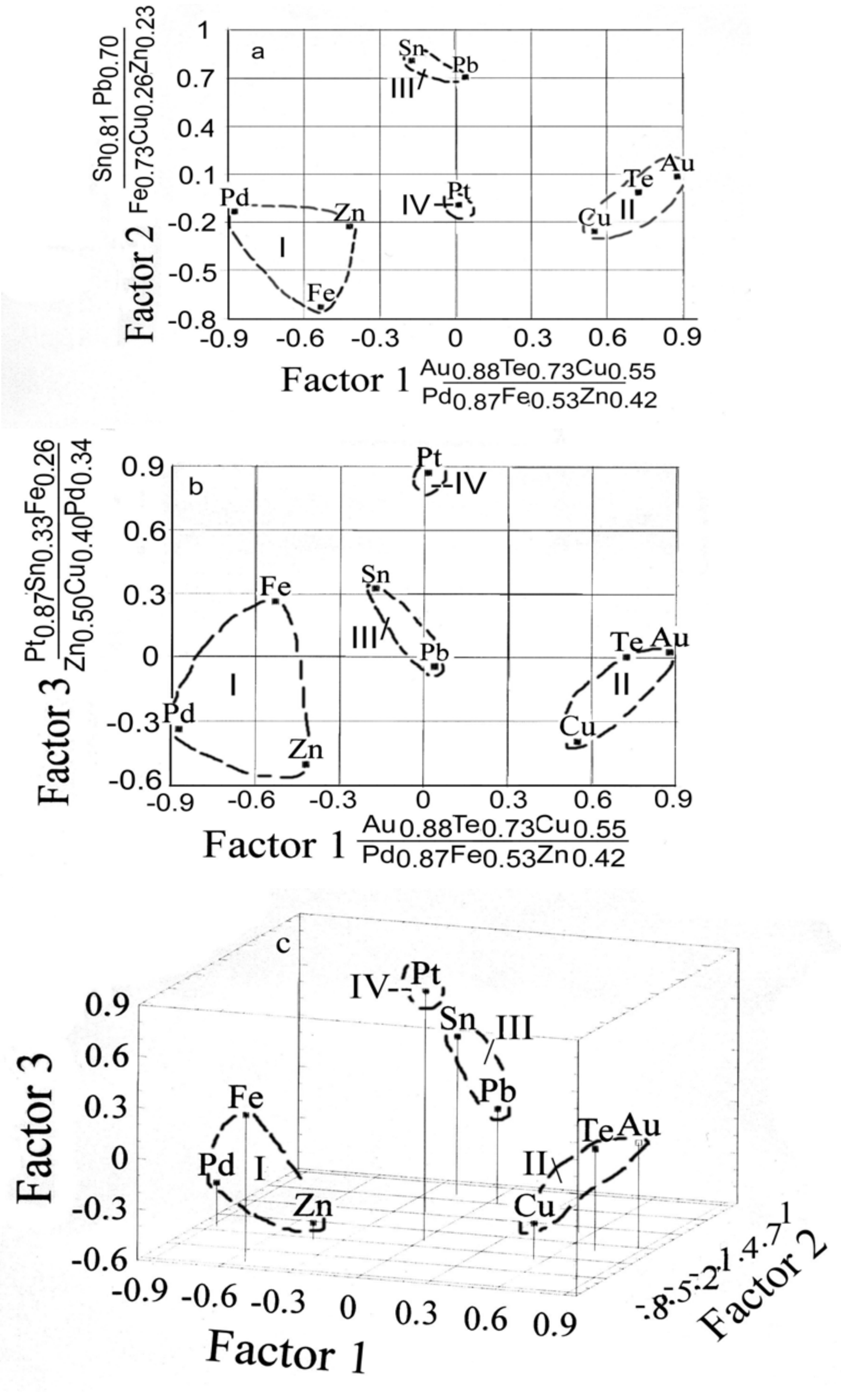

Fig. 4. Plot of factor loading of PdCu compositions, according to Tabl. 4 (n==326).
A: Plain of Factor 1 – Factor 2, B: Plain of Factor 1 – Factor 3, C: 3D diagram of Factor 1-Factor 2-Factor 3.

Appendix 1

PdCu compositions for statistical investigation (total 6 pages)

N	Grain	Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb
1	45-1/1	63,90			31,50	3,80	0.7			
2	45-1/2	60,40	1,30	0,90	33,10	3,40				
3	45-1/3	57,10	4,30		29,70	2,20	1,80			3,20
4	45-1/4	58,80			24,30			15,10		
5	45-1/5	63,60			29,30	5,00	2,60			
6	45-1/6	61,70			32,10	2,60	2,90			1,40
7	45-1/7	57,40	4,30		33,50	4,10	0.9			1,30
8	45-1/8	59,60			30,30	2,90	1,10	3,80		1,30
9	45-1/10	55,30	3,60	1,00	33,30	5,00				
10	45-1/11	57,70	4,80		30,00	5,90	0,50			
11	45-1/12	47,40		13,00	38,20	1,30	0,60			
12	45-1/13	51,60	8,40	2,70	29,20	6,20	0,60			
13	45-1/14	56,70	3,50		28,70	3,10	2,00	3,00		2,20
14	45-1/15	52,10	1,70		43,50	2,10				
15	45-1/16	56,10		8,40	30,60	2,40	2,00			
16	45-1/17	58,40	1,70	1,80	29,30	2,80	1,00	3,10		1,60
17	45-1/18	58,70	1,60	1,30	30,30	1,60	0,65	5,20		
18	45-1/20	60,40	1,70		30,20	2,90	0,90	1,40		2,40
19	45-1/21	54,20	3,80	3,70	29,30	1,40	0,80	2,30		3,50
20	45-1/22	61,90			30,40	6,60				
21	45-1/23	55,50	8,70		28,10	5,40	1,90			
22	45-1/25	58,30	1,20	2,20	29,60	2,20	1,10	3,20		1,90
23	45-1/27	62,20			30,70	5,60	1,80			
24	45-1/28	61,20	1,70		30,70	3,80	1,20			2,30
25	45-1/29	59,40			29,20	1,30	1,00	4,50		3,30
26	45-1/30	61,80			28,50	3,90	1,00	3,10		1,40
27	45-1/31	62,20			30,00	3,50	2,00			
28	45-1/32	61,70			28,30	6,30	2,30			
29	45-1/33	58,90			35,20	1,00	0,70	3,60		
30	45-1/34	55,60	4,00	4,80	29,80	3,50			0,80	1,40
31	45-1/35	62,60			29,70	3,90	2,10	0,90		
32	45-1/36	61,50			29,50	4,40	3,00			
33	45-1/37	60,60	1,00		30,60	5,50	1,10			
34	45-1/38	62,90			29,40	3,00	2,00	1,00		1,20
35	45-1/39	58,80	2,90		31,10	5,80				
37	45-1/40	61,90			30,40	4,20	2,10			
38	45-1/41	57,40	5,60		29,70	4,90	1,00			
39	45-1/42	59,80		3,00	29,50	3,60	2,80		0,80	
40	45-1/44	60,70	1,80		30,30	5,90	0,50			
41	45-1/45	61,70		1,70	29,60	3,90	2,30			
42	45-1/46	57,40		4,00	31,20	4,20			1,50	
43	45-1/47	62,40			27,70	6,00	1,90	0,80		
44	45-1/48	62,40			30,10	5,80	1,10			
45	45-1/49	60,90		1,50	31,10	1,90	2,60	1,20		
46	45-1/50	55,80	1,00	6,70	29,30	4,60	1,10		1,50	
47	45-1/51	62,50			28,30	3,20	3,90	1,00		
48	45-1/52	57,70	4,20		30,70	5,50	0,90			
49	45-1/53	57,90	1,20	2,40	30,60	2,70			4,70	
50	45-1/53	62,80			28,60	8,30				
51	45-1/54	61,80			30,70	6,20	1,00			
52	45-1/55	58,50	3,40		29,70	4,30	2,00			1,40
53	45-1/56	61,80		1,20	28,60	5,00	2,60			
54	45-1/58	58,40		2,60	29,90	4,60	3,10			
55	45-1/59	57,10	3,10	2,60	30,00	4,50			1,30	1,30
56	45-1/60	62,10			28,30	4,20	3,00	1,10		
57	45-1/60	60,30			30,10	4,40	3,60			

N	Grain	Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb
58	45-1/61	61,40			31,10	2,40	2,00	1,20		1,10
59	45-1/62	61,10			30,70	3,60	3,60			
60	45-1/63	61,20	1,10	1,10	29,60	5,30			1,30	
61	45-1/64	59,20	2,80		28,90	7,10	1,20			
62	45-1/64	61,30			31,00	2,30	1,60	1,50		1,00
63	45-1/65	61,30			31,00	2,30	1,60	1,50		1,00
64	45-1/66	61,30			33,80	1,30	2,20			
65	45-1/67	60,60	1,60	1,20	30,00	5,70	0,60			
66	45-1/69	62,30			29,60	3,40	2,80			
67	45-1/71	58,50	4,90		29,20	6,20	0,80			
68	45-1/72	58,40	1,00		33,20	1,80	1,00		2,50	1,40
69	45-1/73	62,80			29,10	5,90	1,30			
70	45-1/76	47,00		16,30	32,10	0,90	1,50		1,00	
71	45-1/77	62,60			30,30	6,20				
72	45-1/78	53,40	10,00		28,80	6,90	0,60			
73	45-1/79	62,30			29,70	3,40	2,60	1,20		
74	45-1/80	60.4			30,00	2,50	0,90	4,80		0,90
75	45-1/81	61,20		1,20	29,90	4,70	2,40			
76	45-1/82	61,10			30,70	3,60	3,60			
77	45-1/85	60,90			31,00	2,50	2,30		1,40	1,30
78	45-1/86	60,40			30,00	3,50	1,40	2,90		
79	45-1/87	56,70			18,80	2,00		20,50		1,10
80	45-1/88	61,30		1,00	28,90	5,00	3,60			
81	45-1/89	55,00	1,90	5,50	30,80	3,90	0,60		1,20	
82	45-1/90	60,60	1,90		29,20	5,00	2,50			
83	45-1/91	51,80		10,90	31,60	0,60		1,00	1,20	1,80
84	45-1/91	35,30		30,70	29,90				2,40	
85	45-1/92	60,20	2,30		28,00	7,70	1,20			
86	45-1/93	60,80	1,20	1,00	30,30	5,40	1,10			
87	45-1/94	63,30			28,60	5,10	2,40			
88	45-1/95	58,50	3,10	1,90	27,80	4,70	2,30			
89	45-1/96	60,90		1,30	28,70	4,80	2,70			
90	45-1/97	51,50		8,40	34,00	1,10			3,40	
91	45-1/99	63,10			28,80	3,10	2,50	1,00		1,00
92	45-1/100	62,40			30,10	6,30				
93	45-1/101	42,00		21,30	34,70	1,60				
94	45-1/102	57,90	3,20		29,60	1,00	0,50	3,30		3,40
95	45-1/103	63,20			29,70	6,10	1,10			
96	45-1/104	59,30	2,10	1,60	30,20	5,10				
97	45-1/105	62,60			28,50	7,00	2,10			
98	45-1/106	59,20	3,60		29,00	5,70	1,00			
99	45-1/107	60,10	1,50	1,80	28,40	4,70	1,30	1,00		
100	45-1,108	57,60	5,80		30,00	5,60	0,90			
101	45-1/109	62,50			27,80	5,20	1,60	1,90		
102	45-1/110	63,70			28,50	3,90	2,80			
103	45-1/111	59,00	1,30	1,40	29,10	1,60	0,50	4,30		2,30
104	45-1/112	62,20	1,00	1,00	29,10	6,10	0,50			
105	45-1/113	58,70	3,70	0,80	28,10	4,60	2,60		0,80	
106	45-1/114	61,50		1,00	29,30	4,30	1,70	1,10		
107	45-1/115	59,70			33,50	2,20	2,20			0.9
108	45-1/116	58,30	3,00	2,10	28,60	5,90			1,80	
109	45-1/117	48,30		16,00	30,40	1,00	1,10	0,90		1,00
110	45-1,118	58,30	1,00		30,30	1,10		7,60		1,00
111	45-1/119	57,50	1,10	5,10	31,50	3,00				
112	45-1/120	61,60		2,20	28,00	4,90	2,30			
113	45-1/121	56,20	5,60		29,20	5,60	1,50		1,00	
114	45-1/122	59,70	2,00	1,60	29,70	4,90	0,40		0,90	
115	45-1/123	58,60	1,00		34,60	3,30	2,10			
116	45-1/124	62,20		1,00	31,80	1,00	1,00		2,80	
117	45-1/125	56,40	6,70		29,10	5,10	1,40			
118	45-1/126	58,30	4,30		29,60	5,90	0,50			
119	45-1/127	61,50			32,00	0,60	1,40	2,20		2,20

N	Grain	Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb
120	45-1/128	62,10		1,20	29,30	4,00	2,70			
121	45-1/129	59,70	1,10	2,80	28,20	4,40	2,30			1,00
122	45-1/130	62,20			29,30	5,60	2,10			
123	45-1/131	62,50		1,10	29,20	4,00	2,60			
124	45-1/134	60,00			32,50	4,10	1,60			
125	45-1/135	61,40			31,40	2,00	1,50	2,10		1,20
126	45-1/136	59,20	1,00		34,00	4,90				
127	45-1/137	44,70	12,70		19,30	1,50		21,40		
128	45-1/138	56,80	6,60	1,00	30,60	5,50	1,00			
129	45-1/139	59,60	1,30	1,10	30,40	1,30	0,70	5,20		
130	45-1/140	59.0		2,60	32,40	2,80	1,00		1,00	
131	45-1/142	55,70	7,20		28,10	7,30	0,90			
132	45-1/143	61,00			30,10	2,30	1,80	3,70		0.8
133	45-1/144	56,20	2,70		27,90	0,80		9,60		2,20
134	45-1/146	55,90	4,80		33,20	1,70	0,50			3,10
135	45-1/147	63,10			28,80	5,30	2,30			
137	45-1/150	55,70	5,50		30,30	5,90	0,80			
138	45-1/152	60,00		1,00	30,00	1,10	0,60	4,70		1,20
139	45-1/153	55,80	3,60	4,00	29,40	4,40	0,50		1,50	
140	45-1/154	60,10	1,80	1,40	28,60	4,20	2,90			
141	45-1/156	53,70	10,10		26,70	4,50	1,20	1,10		1,70
142	45-1/157	62,00			30,20	1,90	1,50	2,90		1,30
143	45-1/158	44,00	3,00	18,60	31,10	1,40	1,10			
144	45-1/159	62,00			32,60	0,40		3,60		1,20
145	45-1/160	61,00	1,30		30,60	5,20	0,50			1,00
146	45-1/161	59,70	4,00		28,20	6,20	1,30			
147	45-1/162	50,80	1,10	9,00	32,20	0,60	0,70	2.0	1,00	1,80
148	45-1/162	34,80	1,10	28,30	31,40	0,50			2,60	
149	45-1/163	61,90			28,70	5,60	3,10			
150	45-1/164	62,30		1,70	28,40	4,40	2,70			
152	45-1/165	53,80	3,10	5,30	15,80	1,70		17,90	0,70	
153	45-1/166	62,20			30,60	5,40	0,61			
154	45-1/167	59,10		2,80	30,60	3,70	2,10		1,10	
155	45-1/168	55,70	4,20		30,10	0,89	0,38	6,20		1,30
157	45-1/169	48,80		9,50	37,40	1,00	1,30			
158	45-1/170	46,80	1,20	16,60	31,00	0,79	0.59	1,60		1,10
159	45-1/171	62,70			29,50	5,80	1,30			
160	45-1/173	62,10			28,90	6,20	1,90			
161	45-1/174	60,70		2,60	28,00	4,60	3,90			
162	45-1/176	60,50			34,30	1,60	0,71	1,70		
163	45-1/178	62,20			28,70	6,70	1,00			
164	45-1/179	33,00	1,20	31,50	28,40	1,30	0,53		2,30	1,10
165	45-1/179	51,50	1,20	10,90	30,40	2,20	1,30		0,90	1,10
167	45-1/180	62,00			29,40	4,50	2,00	1,20		
168	45-1/181	36,80	2,10	26,10	33,60	0,52	0,45			
169	45-1/182	60,90		1,80	28,00	5,20	3,10			
170	45-1/182	54,20		7,40	31,10	0,81	0,82	2,20	1,90	1,40
171	45-1/183	62,20			27,60	6,30	2,60			
172	45-1/184	61,30	1,00	1,20	27,70	5,20	2,40			
173	45-1/185	57,40	5,10		30,10	5,80	0,87			
174	45-1/186	61,80			30,00	0,65	0,65			5,40
175	45-1/187	51,40	4,00	7,50	31,00	2,40	1,80	1,00		
176	45-1/188	54,10	8,20		30,10	5,30	1,00			
177	45-1/189	62,90			29,60	5,60	1,60			
178	45-1/190	61,70			29,00	5,20	2,50			
179	45-1/191	61,20			30,20	0,47	1,60	4,80		1,20
180	45-2/1	50,70		10,70	31,90	0,43	0,44	1,30	1,20	2,10
181	45-2/1	32,70		28,00	35,00	0,72			3,40	
182	45-2/2	62,70			29,90	2,70	2,80	1,00		
183	45-2/4	63,30			28,80	6,70				
184	45-2/5	60,20		1,30	29,00	0,78	0,52	7,30		
185	45-2/6	53,90		10,00	31,40	1,60	1,80			
186	45-2/7	62,10			29,70	6,30	1,50			

N	Grain	Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb
187	45-2/8	62,20			30,10	5,60	1,80			
188	45-2/9	63,40			30,90	2,50	1,70	0,91		
189	45-2/10	59,30	1,40	1,90	28,40	2,40	1,30	3,20		1,80
190	45-2/12	59,80	1,70	3,40	16,60	0,92		15,20		2,20
191	45-2/13	60,20		2,60	28,80	4,30	2,90			
192	45-2/14	63,00			29,80	3,70	2,40			
193	45-2/15	37,30		25,10	33,10	0,68			2,50	1,10
194	45-2/16	59,80	1,20		30,70	4,40	0,56		1,80	
195	45-2/17	62,30			28,60	6,80	0,62			
196	45-2/18	61,10			29,60	2,70	2,10	1,40		1,30
197	45-2/19	62,00		1,30	28,80	4,30	2,40			
198	45-2/20	56,60	5,50		30,00	4,70	1,30			
199	45-2/21	62,10			29,70	6,50	0,59			
200	45-2/22	50,80	1,40	11,00	30,90	2,20	0,39		2,20	
201	45-2/23	57,10	2,70	1,60	27,00	1,00	0,40	7,00		3,20
202	45-2/24	56,60	1,40	4,70	28,70	3,20	1,60		2,00	1,10
203	45-2/25	55,40	1,40	1,00	37,40	2,90			1,50	
204	45-2/26	57,20	3,10	1,70	29,20	4,70	1,10		1,60	
205	45-2/27	62,70			28,90	5,50	2,10			
206	45-2/28	58,90	1,10	1,90	29,20	1,10		5,40		2,10
207	45-2/29	58,60	3,90	1,00	28,40	5,40	1,00			
208	45-2/30	59,80	1,20		28,90	4,30	2,20		1,60	1,20
209	45-2/31	56,20	4,30	2,00	30,20	5,50	0.93			
210	45-2/32	62,30			29,40	4,70	2,40			
211	45-2/34	46,30	1,00	17,50	32,00	0,81	0,56	0,86		
212	45-2/35	60,70	2,90		28,80	6,20	0,86			
213	45-2/37	39,80		23,30	31,40	0,83			3,10	
214	45-2/37	52,80		8,90	32,10	1,00	0,53	2,40	1,70	
215	45-2/39	62,20			29,60	4,90	1,90			
216	45-2/42	52,20		9,80	32,40	0,93	0,46	1,20	1,30	1,70
217	45-2/44	53,30	9,60		28,00	7,30	1,10			
218	45-2/45	61,70			33,20	3,30	1,70			
219	45-2/47	61,30		2,10	28,80	4,20	2,40			
220	45-2/49	62,90			31,60	4,00	0,55			
221	45-2/55	63,10			27,60	6,30	2,00			
222	45-2/58	61,30	1,60		28,10	5,00	2,50			
223	45-2/60	52,90		9,70	31,60	2,80	0,75		1,50	
224	45-2/61	59,00	3,30	1,10	28,80	3,10	1,20		1,90	1,00
225	45-2/62	62,00			30,40	5,10	0,52			1,00
226	45-2/63	57,30	1,90	1,60	28,10	1,30	7,20			1,50
227	45-2/65	49,50	1,30	12,90	30,10	1,30	1,20	1,30		2,40
228	45-2/66	52,60		9,20	31,40	2,50		2,10	1,00	
229	45-2/67	62,20		1,10	28,30	5,00	2,40			
230	75-3	64,40			30,30	6,40	0,39			
231	75-4	62,30			29,40	4,70	1,50	1,40		
232	75-5	60,60			31,00	4,40	1,30	1,30		
233	75-6	62,70			28,90	5,80	1,70			
234	75-7	60,90		1,10	30,30	3,50	2,10	1,40		
235	75-8	46,30	1,00	17,60	30,10	0.97	1,50		1,50	
236	75-9	61,40			32,10	1,00	0,34	4,60		
237	75-13	59,90		3,00	29,70	4,00	2,30		0.8	
238	75-14	61,70			30,60	3,90	0,74	2,20		
239	75-18	63,30			28,50	4,70	2,00			
240	75-19	60,10			32,20	2,50	1,60		1,80	
241	75-20	57,10	1,20		34,40	6,20	0,39			
242	75-21	53,20		7,40	33,00	0,89	0,78	2,20	2,20	
243	75-22	62,20			29,20	5,00	1,80	1,10		
244	75-23	56,60	5,20		29,30	7,00	0,77			
245	75-24	57,50	4,20		30,20	5,60	1,90			
246	75-26	56,10		1,30	38,30	1,40	1,30		0.8	
247	75-27	62,30			29,60	1,60	0,53	4,30		1,50
248	75-28	56,60		7,20	29,90	2,50	2,40		1,30	

N	Grain	Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb
249	75-30	61,80			29,80	5,20	1,80	1,00		
250	75-31	61,90			30,00	4,40	2,80			
251	75-32	62,40			29,40	2,20	1,00	4,00		
252	75-33	62,70			27,70	5,40	2,40			
253	75-34	60,40			29,10	3,50	1,00	3,10		1,40
254	75-35	61,60			32,50	3,40	1,70			
255	75-36	62,60			28,80	6,00	1,80			
256	75-37	61,40			28,60	4,90	2,90			1,20
257	75-38	61,90			29,10	4,30	1,50	1,60		
258	75-39	42,40	1,20	22,40	31,40	0,48	1,20		0,80	
259	75-40	62,40			28,60	4,60	3,30			
260	75-41	62,10			28,10	6,20	1,70			
261	75-42	60,30			33,30	2,20	2,10	1,00		
262	75-43	61,80			29,80	4,70	2,10			
263	75-44	61,20		1,50	28,80	3,90	1,60	1,70		
264	75-45	62,00			29,00	5,80	1,70	1,40		
265	75-46	61,50			31,40	2,50	0,95	2,30		
266	75-47	63,10			27,30	5,50	2,00	1,20		
267	75-48	62,00			28,80	5,50	1,90	0,71		
268	75-49	61,30	2,70		30,00	5,10	1,70			
269	75-50	63,00			31,30	1,90	1,00	3,60		1,40
270	75-51	63,60			29,90	3,80	3,70			
271	75-52	61,40			29,80	4,70	2,00			1,00
272	75-53	62,60			29,30	3,10	1,50	3,30		
273	75-54	59,00	1,00		34,30	4,90				
274	75-55	63,00			27,50	5,40	2,70			
275	75-56	63,20			27,10	5,80	2,30			
276	75-57	61,90		1,10	27,70	4,20	2,70	0,74	0,72	
277	75-58	62,30			30,20	3,90	1,50	0,90		
278	75-60	61,90		1,80	28,60	4,10	3,10			
279	75-61	62,90			31,30	3,00	2,30			
280	75-62	62,90			29,50	3,00	1,00	2,60		
281	75-63	62,70			28,70	4,50	1,90	1,30		
282	75-64	63,40			27,90	6,10	2,10			
283	75-65	55,70	7,90		29,20	6,10	1,00			
284	75-66	61,70		1,10	28,40	4,10	2,00	1,70		
285	75-67	62,40			28,90	4,50	1,60	2,50		
286	75-68	60,40			30,40	1,30	0,68	6,70		
287	75-69	61,10	1,80		28,20	3,10	1,80	1,20		1,90
288	75-70	60,10	2,10		31,70	4,00	1,50			
289	75-71	63,00			28,60	4,30	3,20			
290	75-72	57,50			30,80	0,37	0,77	9,90		
291	75-73	62,90			30,30	3,50	1,30	1,30		
292	75-74	62,60		1,20	28,00	4,00	3,60			
293	75-75	63,60			27,20	5,70	2,30			
294	75-76	63,20			27,60	6,50	1,90			
295	75-77	63,20			27,90	6,30	1,80			
296	75-78	63,10			28,00	5,40	2,10			
297	75-79	62,00		1,00	29,40	2,80	1,30	2,70		
298	75-80	63,78			28,70	5,80	0,70			
299	75-82	63,30			28,70	5,70	2,10			
300	125-1/2	63,70			26,50	4,40	3,30			
301	125-1/3	63,80			28,60	3,70	2,80			
302	125-1/4	62,60		1,20	28,00	4,60	1,90	1,10		
303	125--1/5	62,60		1,70	27,60	4,60	3,30			
304	125-1/6	63,60			28,40	4,00	3,00			
305	125-1/7	61,30		2,10	28,40	3,50	4,40			
306	125-1/9	54,70	10,00		27,90	6,30	0,68			
307	125-1/10	52,20		11,30	28,90	2,00	2,60		1,70	
308	125-1/11	61,90		1,00	28,60	7,10	0,74			
309	125-1/13	63,20			28,80	4,90	2,10			
310	125-1/14	62,60			29,40	4,70	1,70	0.9		
311	125-2/2	64,20			28,00	7,10	0,50			

N	Grain	Pd	Pt	Au	Cu	Fe	Zn	Sn	Te	Pb
312	125-2/3	61,50			29,90	0,33	1,40	1,70		3,90
313	125-2/3	62,80			29,70	4,30	1,00			1,50
314	125-2/5	60,10	1,30		30,30	0,80	0,82	3,80		1,90
315	125-2/6	61,30		2,60	27,00	4,50	3,30		0.8	
316	125-2/7	61,60		1,00	30,30	3,60	2,60			
317	125-2/8	63,50			28,70	6,00	1,70			

Appendix 2

Sample 90-24 1057.55

Electron microprobe analyses of sulphides and precious metal phases.

Analyses collected at Department of Geology, University of Copenhagen Denmark using a GEOL Superprobe and metal and sulphide standarts at 20 kV and 15 nA.
by H. Rasmussen.

Comment: 1) Chalcocin var. Is a not determined phase; 2) "Cu-Fe-S melt" are broad beam scanning analyses of Cu-Fe droplets, that may accidentally include small grains of PGMs.

Cu-sulphides

thin section	level	type	grain	mineral	Cu	Fe	S	Au	Pd	Pt	Sn	Bi	Zn	Te	Sb	As	Ag	Ni	TOTAL
24-1057.55	Pd5	S	1a	bornite	63,92	11,35	25,48	0,01	0,03	0,15	0,01	0,01	n.a.	0,07	0,04	0,01	0,01	0,03	101,12
24-1057.55	Pd5	S	3b	bornite	63,31	11,35	26,44	0,01	0,01	0,18	0,03	0,01	n.a.	0,10	0,01	0,04	0,01	0,05	101,55
24-1057.55	Pd5	S	3a	bornite	62,91	11,10	25,50	0,06	0,03	0,34	0,14	0,30	n.a.	0,01	0,03	0,01	0,01	0,06	100,49
24-1057.55	Pd5	S	8b	bornite	62,91	11,63	25,49	0,08	0,01	0,13	0,01	1,04	n.a.	0,01	0,07	0,10	0,01	0,06	101,54
24-1057.55	Pd5	S	5a	bornite	62,84	11,21	25,55	0,18	0,01	0,01	0,07	0,11	n.a.	0,01	0,02	0,01	0,01	0,07	100,09
24-1057.55	Pd5	S	8a	bornite	62,75	11,36	25,52	0,32	0,01	0,26	0,07	0,56	n.a.	0,01	0,01	0,01	0,01	0,01	100,89
24-1057.55	Pd5	S	8a	bornite	62,72	11,22	25,27	0,45	0,01	0,08	0,01	0,01	n.a.	0,06	0,01	0,09	0,01	0,09	100,03
24-1057.55	Pd5	S	12	bornite	62,62	11,35	25,37	0,26	0,01	0,01	0,01	0,01	n.a.	0,14	0,01	0,01	0,01	0,06	99,87
24-1057.55	Pd5	S	5a	bornite	62,59	11,35	25,74	0,18	0,11	0,01	0,06	0,01	n.a.	0,07	0,09	0,14	0,01	0,07	100,43
24-1057.55	Pd5	S	9	bornite	62,43	12,03	25,45	0,01	0,01	0,04	0,08	0,01	n.a.	0,01	0,01	0,01	0,01	0,01	100,11
24-1057.55	Pd5	S	12	bornite	62,42	11,69	25,47	0,01	0,06	0,33	0,09	0,31	n.a.	0,01	0,05	0,04	0,01	0,01	100,50
24-1057.55	Pd5	S	9	bornite	62,35	12,00	25,63	0,16	0,04	0,01	0,01	0,55	n.a.	0,06	0,01	0,16	0,01	0,03	101,02
24-1057.55	Pd5	S	5b	bornite	61,18	11,55	25,38	0,01	0,01	0,01	0,15	0,01	n.a.	0,07	0,01	0,01	0,01	0,01	98,41
24-1057.55	Pd5	S	3c	digenite	78,50	1,32	21,43	0,01	0,03	0,31	0,01	0,01	n.a.	0,09	0,01	0,04	0,01	0,01	101,79
24-1057.55	Pd5	S	5a	digenite	77,01	1,41	21,95	0,05	0,01	0,02	0,01	0,01	n.a.	0,01	0,02	0,01	0,01	0,07	100,59
24-1057.55	Pd5	S	8a	digenite	77,50	1,22	21,22	0,01	0,01	0,05	0,01	0,01	n.a.	0,06	0,01	0,01	0,01	0,01	100,13
24-1057.55	Pd5	S	8b	digenite	76,03	3,23	21,68	0,01	0,06	0,01	0,01	0,91	n.a.	0,06	0,05	0,07	0,01	0,04	102,18
24-1057.55	Pd5	S	12	Chalcocin var.	69,27	6,94	23,67	0,01	0,01	0,01	0,01	0,01	n.a.	0,06	0,01	0,07	0,01	0,05	100,12
24-1057.55	Pd5	S	8a	Chalcocin var.	69,11	6,17	23,73	0,17	0,01	0,19	0,01	0,01	n.a.	0,04	0,10	0,01	0,01	0,01	99,57
24-1057.55	Pd5	S	5b	Chalcocin var.	67,75	6,85	24,06	0,15	0,01	0,01	0,08	0,69	n.a.	0,06	0,01	0,01	0,01	0,01	99,70
24-1057.55	Pd5	S	13	Chalcocin var.	65,68	7,85	24,35	0,01	0,07	0,01	0,01	0,01	n.a.	0,10	0,01	0,01	0,01	0,02	98,13

Appendix 2 continued

Scans of Cu-Fe droplets

thin section	level	type	grain	mineral	Cu	Fe	S	Au	Pd	Pt	Sn	Bi	Zn	Te	Sb	As	Ag	Ni	TOTAL
24-1057.55	Pd5	S-area	8a	"Cu-Fe-S melt"	70,62	5,98	23,37	0,08	0,05	0,01	0,07	0,30	n.a.	0,01	0,03	0,01	0,01	0,01	100,56
24-1057.55	Pd5	S-area	8a	"Cu-Fe-S melt"	70,57	6,36	23,56	0,01	0,01	0,47	0,01	0,06	n.a.	0,01	0,01	0,01	0,01	0,06	101,15
24-1057.55	Pd5	S-area	8a	"Cu-Fe-S melt"	69,67	6,61	23,62	0,01	0,01	0,09	0,13	0,03	n.a.	0,01	0,07	0,01	0,01	0,07	100,34
24-1057.55	Pd5	S-area	8a	"Cu-Fe-S melt"	68,63	7,51	24,03	0,45	0,01	0,07	0,05	0,01	n.a.	0,15	0,01	0,01	0,01	0,02	100,96
24-1057.55	Pd5	S-area	8a	"Cu-Fe-S melt"	68,53	7,28	23,72	0,01	0,01	0,01	0,01	0,01	n.a.	0,04	0,01	0,01	0,01	0,01	99,66
24-1057.55	Pd5	S-area	8a	"Cu-Fe-S melt"	68,39	7,39	24,14	0,41	0,14	0,01	0,08	0,16	n.a.	0,15	0,01	0,01	0,01	0,07	100,96
24-1057.55	Pd5	S-area	8a	"Cu-Fe-S melt"	67,28	8,79	24,30	0,01	0,06	0,01	0,05	0,01	n.a.	0,08	0,03	0,28	0,01	0,09	101,00
24-1057.55	Pd5	S-area	8a	"Cu-Fe-S melt"	66,41	8,35	24,32	0,01	0,01	0,04	0,01	0,01	n.a.	0,05	0,17	0,32	0,01	0,06	99,76
24-1057.55	Pd5	S-area	8a	"Cu-Fe-S melt"	65,66	8,89	24,07	0,03	0,01	0,01	0,01	1,06	n.a.	0,01	0,15	0,01	0,01	0,01	99,94
24-1057.55	Pd5	S-area	8a	"Cu-Fe-S melt"	65,08	7,95	23,50	0,07	0,02	0,01	0,09	0,41	n.a.	0,09	0,03	0,01	0,01	0,01	97,28
24-1057.55	Pd5	S-area	8a	"Cu-Fe-S melt"	65,03	9,88	24,85	0,01	0,03	0,03	0,02	0,46	n.a.	0,01	0,03	0,18	0,01	0,08	100,62
24-1057.55	Pd5	S-area	8a	"Cu-Fe-S melt"	64,80	8,09	23,72	0,09	0,01	0,63	0,03	0,01	n.a.	0,01	0,10	0,05	0,01	0,06	97,62
24-1057.55	Pd5	S-area	8a	"Cu-Fe-S melt"	63,24	10,87	24,91	0,01	0,01	0,04	0,01	1,03	n.a.	0,06	0,03	0,01	0,01	0,03	100,26

Appendix 2 continued

Precious metal phases

thin section	level	type	grain	mineral	Cu	Fe	S	Au	Pd	Pt	Sn	Bi	Zn	Te	Sb	As	Ag	Ni	TOTAL
24-1057.55	Pd5	PGMPD	1	Pd(Pt)Cu	28,90	7,33	0,01	0,26	58,17	4,04	0,14	0,50	n.a.	0,26	0,01	0,64	0,01	0,07	100,33
24-1057.55	Pd5	PGMPD	1	Pd(Pt)Cu	28,88	7,32	0,08	0,68	57,63	6,97	0,15	0,01	n.a.	0,24	0,01	0,37	0,01	0,05	102,39
24-1057.55	Pd5	S-area	8a	PdCu	31,38	4,39	0,06	2,18	59,61	1,57	0,06	0,01	n.a.	0,70	0,07	0,64	0,01	0,18	100,86
24-1057.55	Pd5	PGMPD	9a	PdCu	33,35	6,89	1,65	0,81	57,69	0,07	0,01	0,04	n.a.	0,07	0,02	0,18	0,01	0,01	100,80
24-1057.55	Pd5	PGMPD	10	PdCu	32,13	7,02	1,22	0,19	56,87	0,33	0,01	0,01	n.a.	0,15	0,01	0,47	0,01	0,01	98,43
24-1057.55	Pd5	PGMPD	8a	PdCu	31,18	4,29	0,01	1,63	59,43	1,04	0,16	0,01	n.a.	0,70	0,02	0,60	0,01	0,10	99,18
24-1057.55	Pd5	PGMPD	8b	PdCu	31,30	4,65	0,09	2,29	59,65	0,21	0,01	0,01	n.a.	0,74	0,04	0,15	0,01	0,09	99,26
24-1057.55	Pd5	PGMPD	12	PdCu	30,68	5,79	0,01	0,47	56,75	5,70	0,09	1,49	n.a.	0,26	0,03	0,78	0,01	0,09	102,15
24-1057.55	Pd5	PGMPD	13	PdCu	31,51	5,74	0,11	0,01	61,27	0,01	0,01	0,31	n.a.	0,08	0,01	0,09	0,01	0,01	99,17
24-1057.55	Pd5	PGMPD	a igen	PdCu	32,79	6,72	0,88	0,78	58,18	0,45	0,07	0,92	n.a.	0,06	0,01	0,29	0,01	0,04	101,20
24-1057.55	Pd5	PGMPD	1	Pd(Pt)Cu	27,96	7,09	0,05	1,13	57,14	6,64	0,02	0,08	n.a.	0,19	0,01	0,60	0,01	0,13	101,03
24-1057.55	Pd5	PGMPD	3	Pd(Pt)Cu	30,96	4,25	0,01	0,49	56,98	4,58	0,21	0,04	n.a.	0,31	0,01	0,45	0,01	0,09	98,39
24-1057.55	Pd5	PGMPD	9b	Pd(Fe)Cu	28,15	12,61	7,83	0,10	37,78	0,76	0,31	0,30	n.a.	0,10	0,01	0,64	0,01	0,06	88,65
24-1057.55	Pd5	PGMPD	5a	Pd(Au)Cu	37,74	5,23	2,25	11,51	43,03	0,73	0,01	0,01	n.a.	0,02	0,01	0,11	0,01	0,07	100,72
24-1057.55	Pd5	PGMPD	5a	Pd(Au)Cu	33,75	11,16	2,12	11,05	37,20	1,18	0,01	0,28	n.a.	0,01	0,09	0,33	0,01	0,05	97,25
24-1057.55	Pd5	PGMPD	a igen	Pd(Au)Cu	43,68	5,55	5,06	8,52	35,59	0,39	0,04	0,01	n.a.	0,03	0,03	0,43	0,01	0,07	99,42
24-1057.55	Pd5	PGMPD	5b	Pd(Au)Cu	30,51	4,25	0,01	8,21	53,56	3,33	0,07	0,16	n.a.	0,56	0,07	0,47	0,01	0,07	101,30
24-1057.55	Pd5	PGMPD	13	vasilite	15,89	0,29	11,77	0,06	72,30	0,08	0,06	0,04	n.a.	0,01	0,08	0,27	0,01	0,14	101,01
24-1057.55	Pd5	PGMPD	13	vasilite	14,82	0,27	12,31	0,07	72,63	0,01	0,01	1,20	n.a.	0,06	0,15	0,39	0,01	0,08	102,01

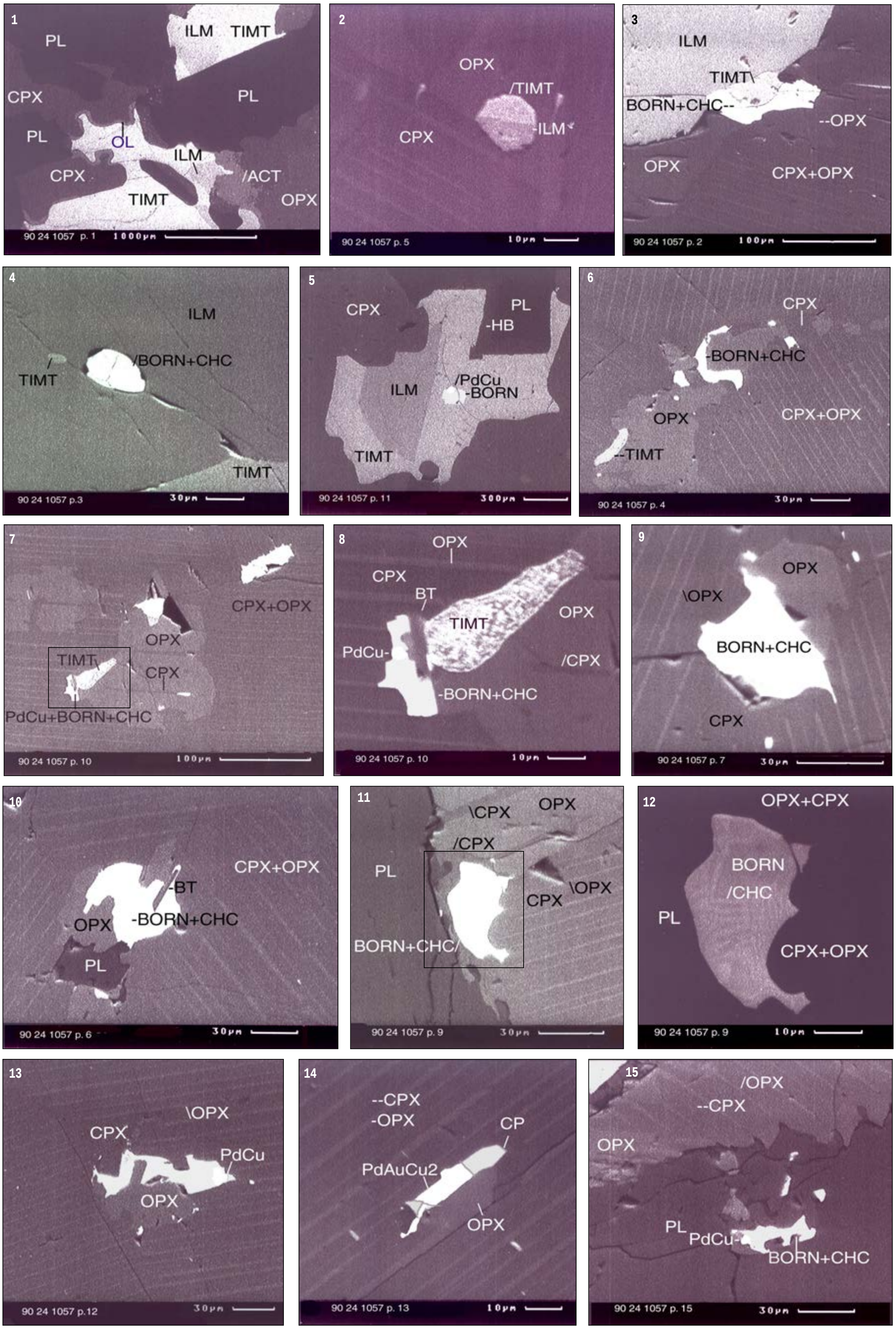

Plate 1. Relationships of rock-forming minerals, Fe-Ti-oxides, sulphides and PGM in the oxide-rich tholeiitic gabbros of the sample 90-24, 1057 (1-15). 8: The part of 7; 12: The part of 11. SEM-image (BIE), thin polished section # 24-1057.14.

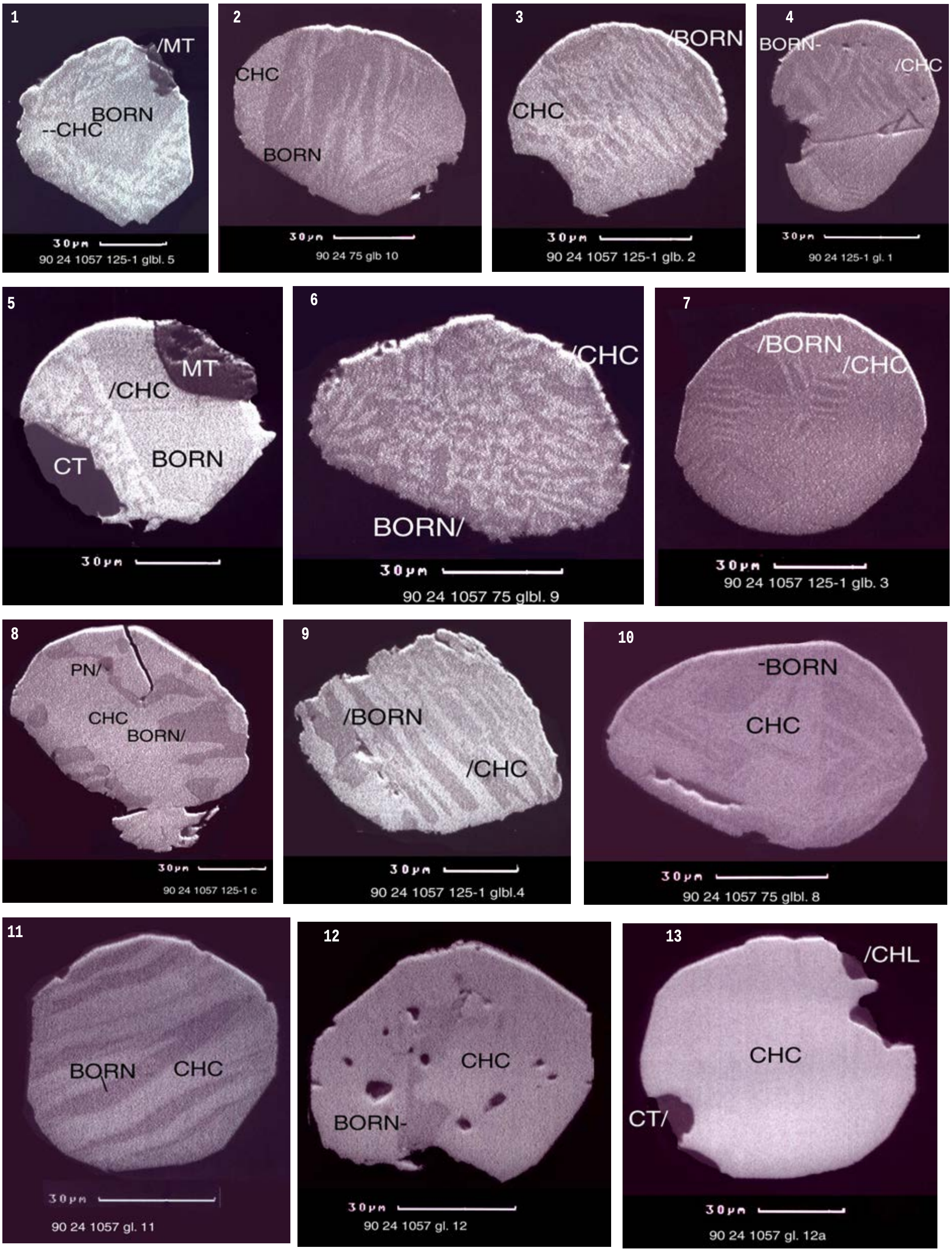

Plate 2. Sulphide mineralisation globules of oxide-rich tholeiitic gabbros, the sample 90-24, 1057; polished sections of grains, extracted in the heavy concentrates; SEM-image (BIE).

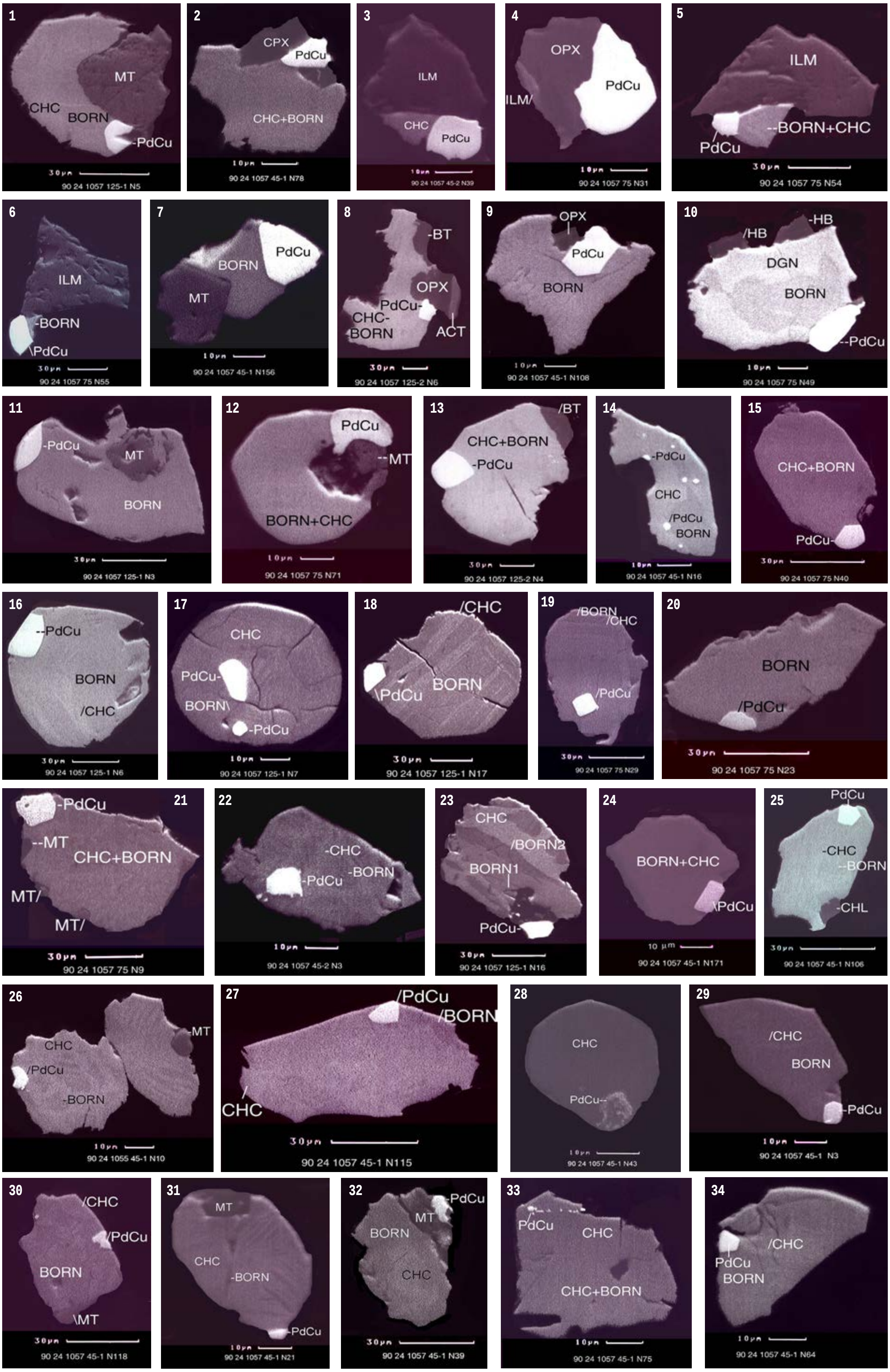

Plate 3: Sulphide globules with inclusions of PdCu preserved after disintegration of the sample 90-24, 1057 (1-95); polished section, SEM-image (BIE).

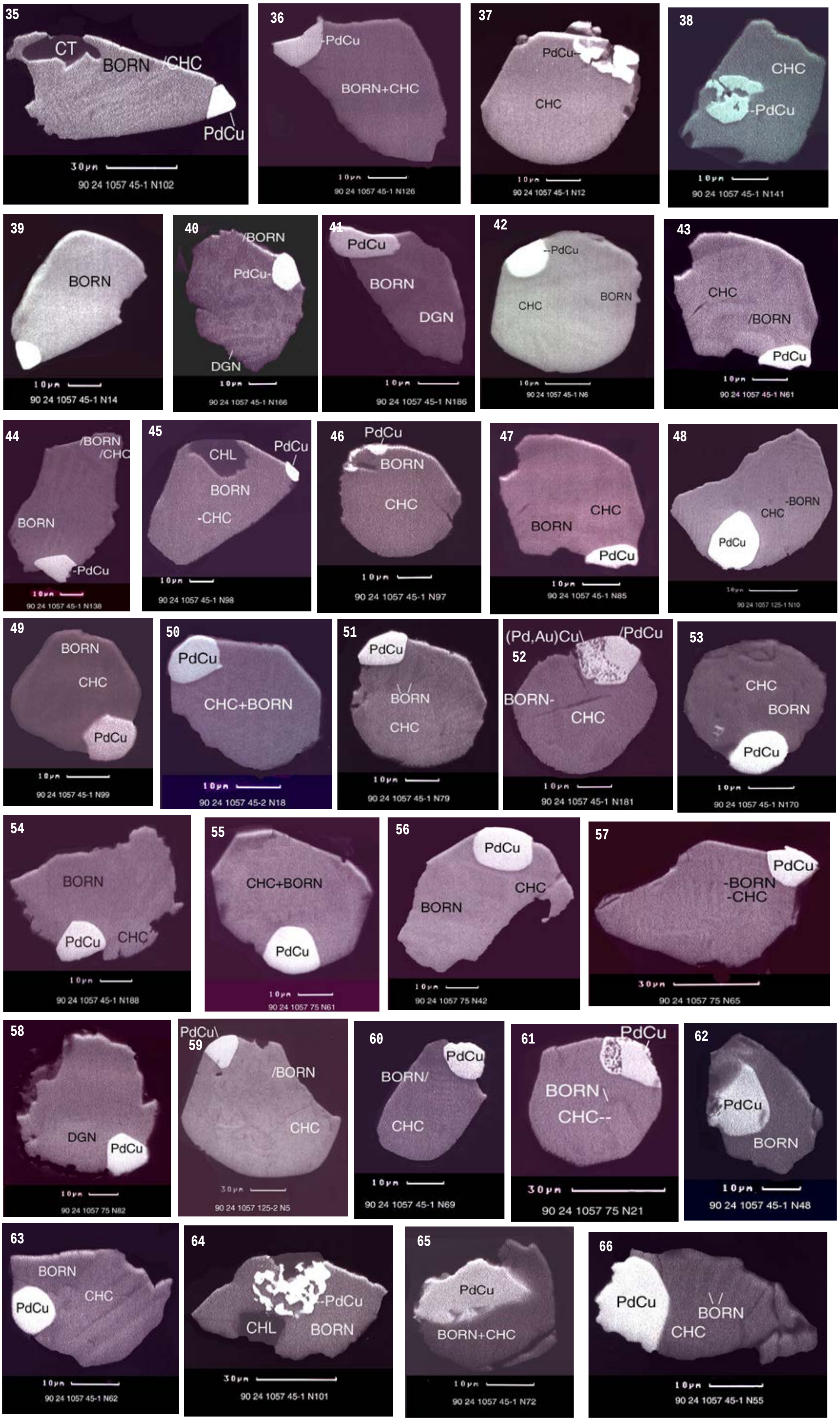

Plate 3 continued: Sulphide globules with inclusions of PdCu preserved after disintegration of the sample 90-24, 1057 (1-95); polished section, SEM-image (BIE).

Plate 3 continued. Sulphide globules with inclusions of PdCu preserved after disintegration of the sample 90-24, 1057 (1-95); polished section, SEM-image (BIE).

Plate 4. Sulphide globules with inclusions of the PdCu mineral phase in heavy concentrates that are partly destroyed during disintegration of the sample 90-24, 1057 (1-81); polished section, SEM-image (BIE).

Plate 4 continued. Sulphide globules with inclusions of the PdCu mineral phase in heavy concentrates that are partly destroyed during disintegration of the sample 90-24, 1057 (1-81); polished section, SEM-image (BIE).

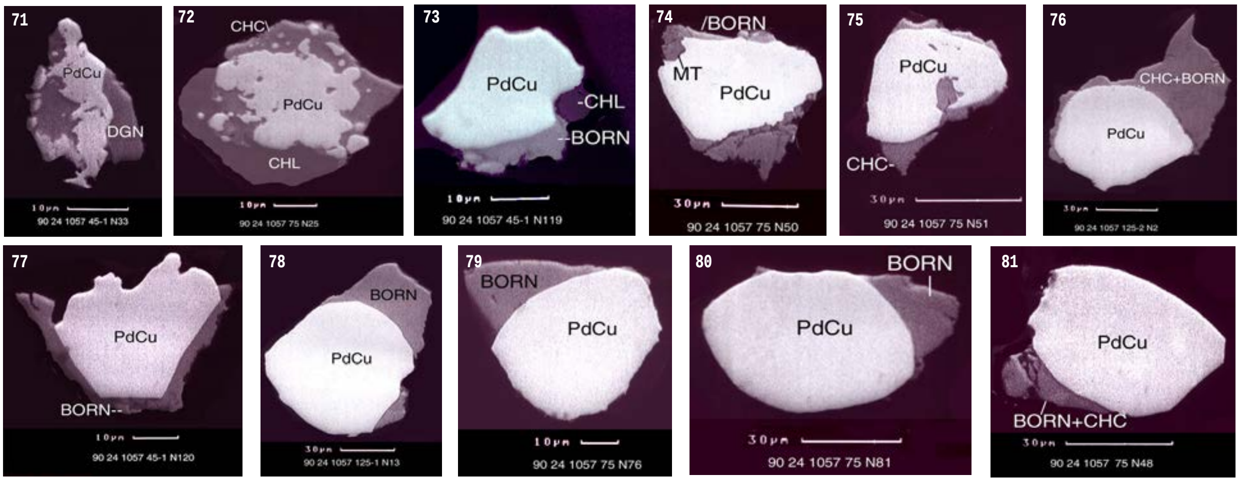

Plate 4 continued. Sulphide globules with inclusions of the PdCu mineral phase in heavy concentrates that are partly destroyed during disintegration of the sample 90-24, 1057 (1-81); polished section, SEM-image (BIE).

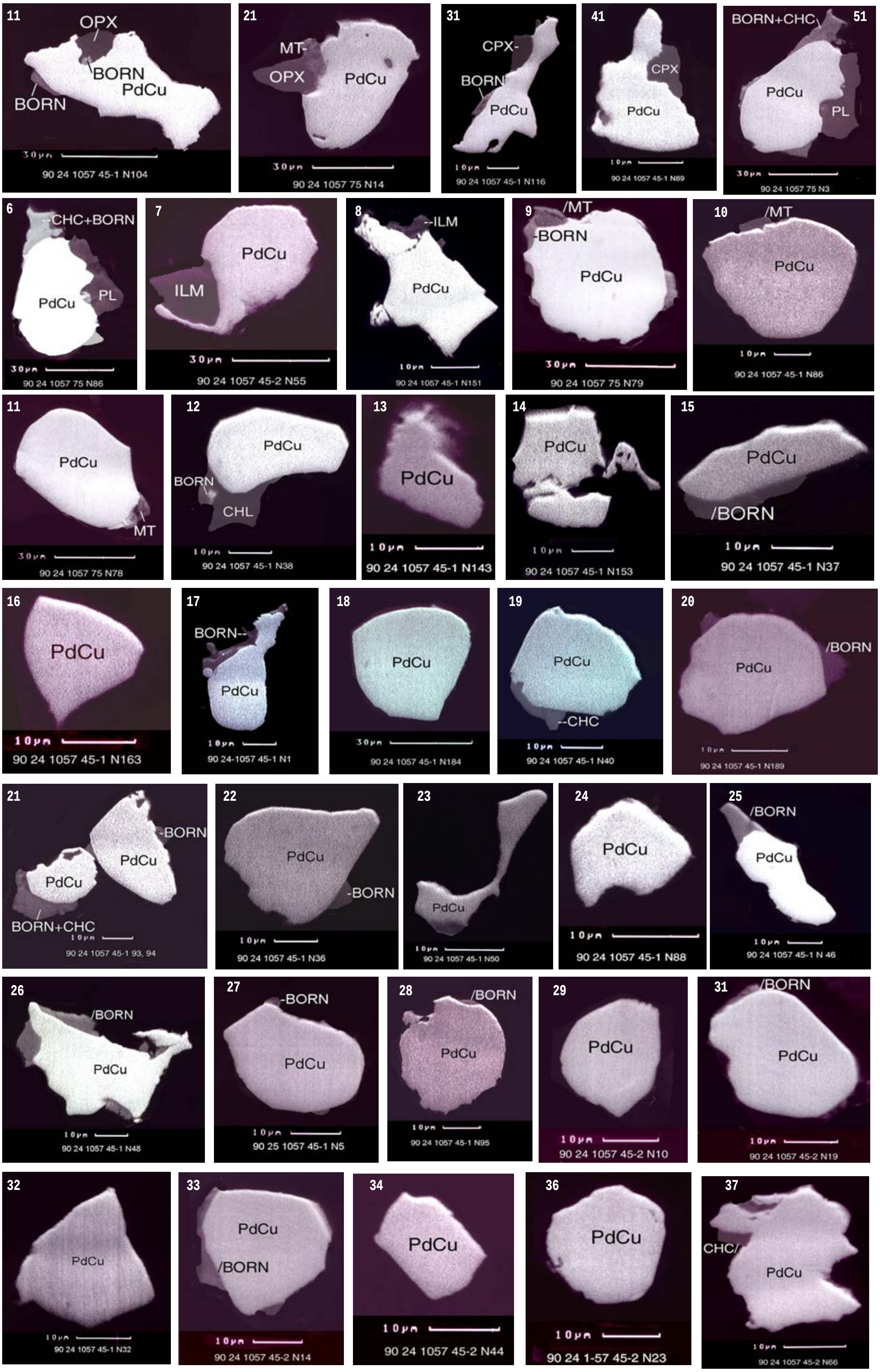

Plate 5. Totally liberated grains of PdCu mineral phase in heavy concentrates of the sample 90-24, 1057 (1-94); polished section, SEM-image (BIE).

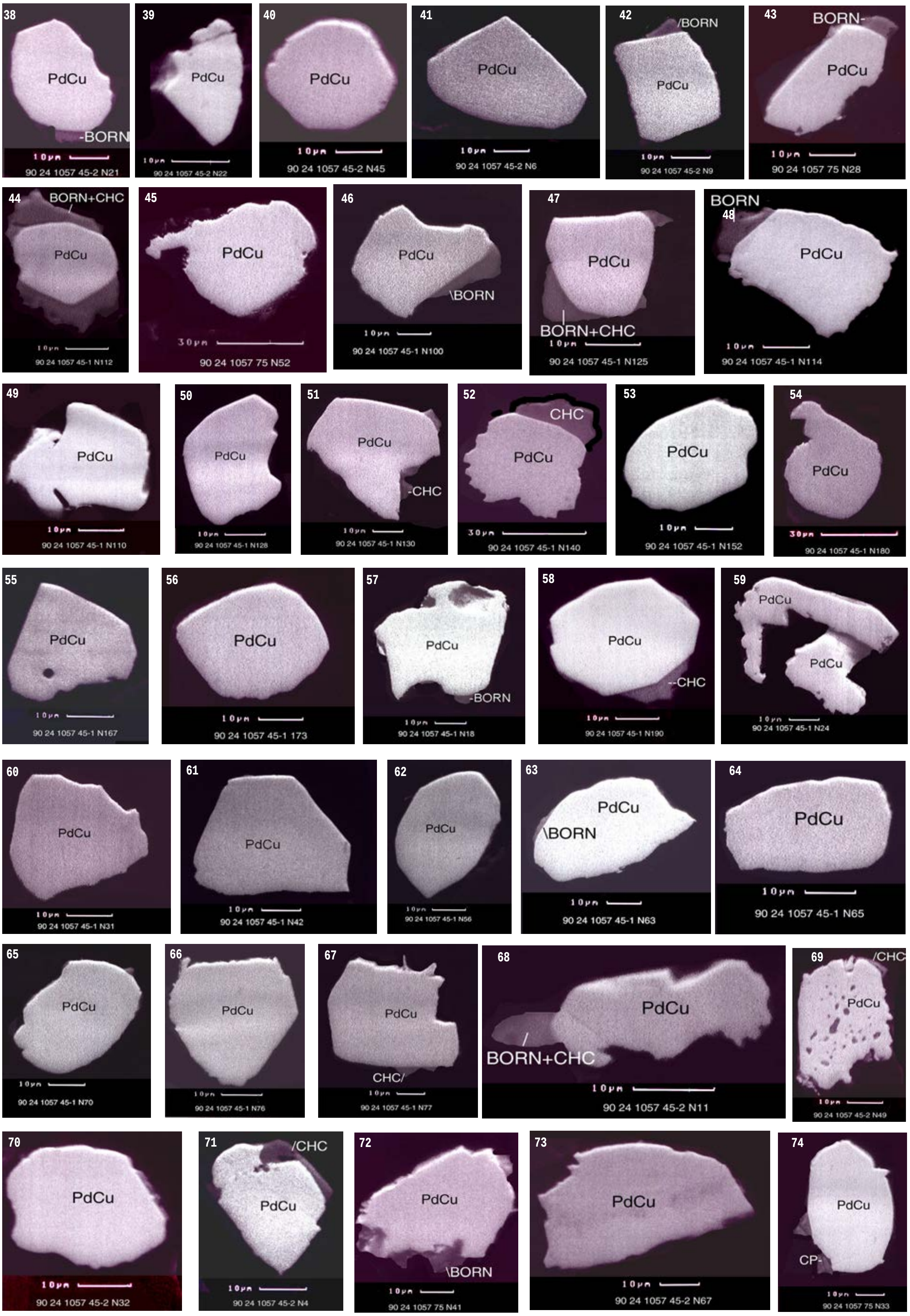

Plate 5 continued. Totally liberated grains of PdCu mineral phase in heavy concentrates of the sample 90-24, 1057 (1-94); polished section, SEM-image (BIE).

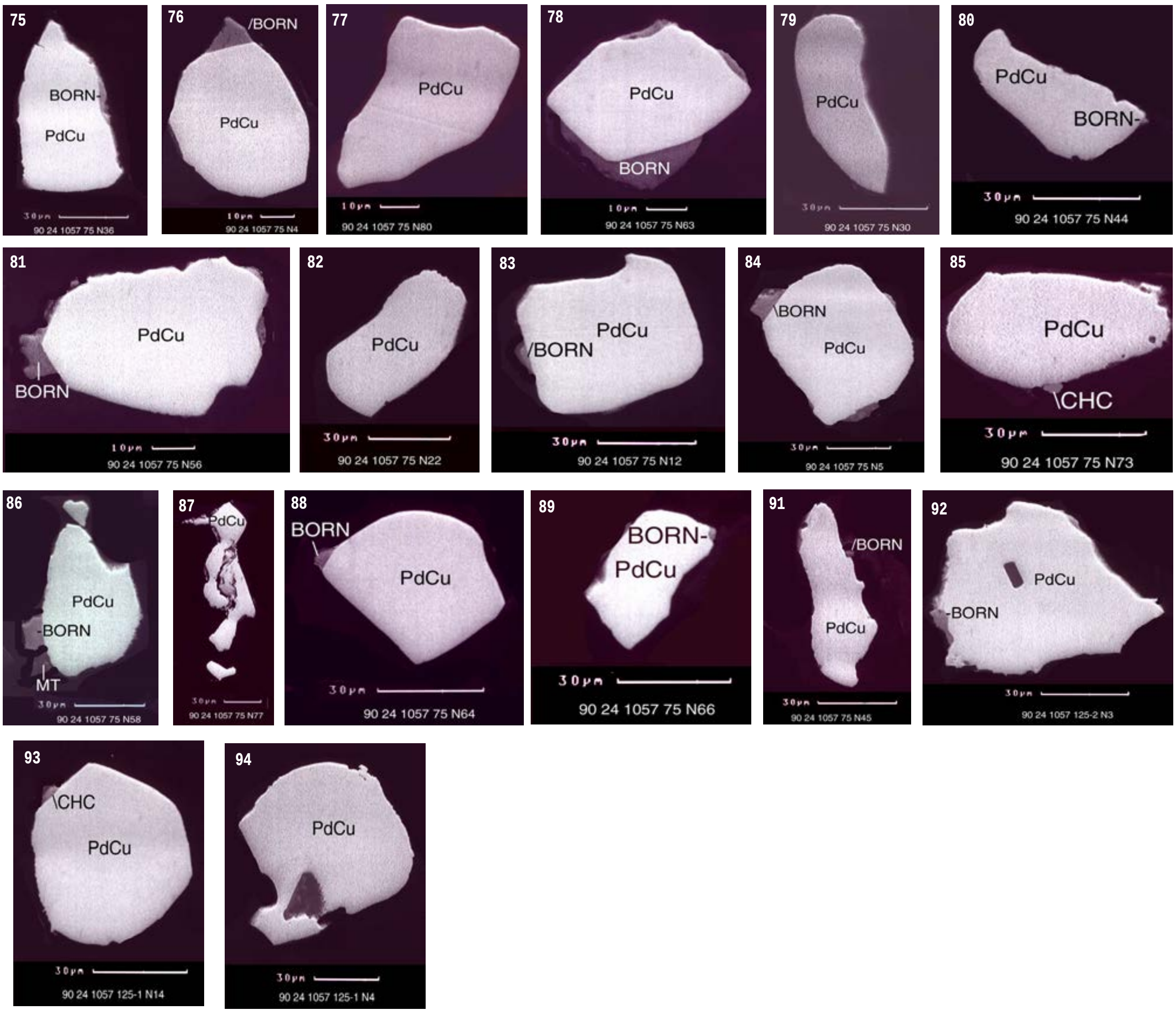

Plate 5 continued. Totally liberated grains of PdCu mineral phase in heavy concentrates of the sample 90-24, 1057 (1-94); polished section, SEM-image (BIE).

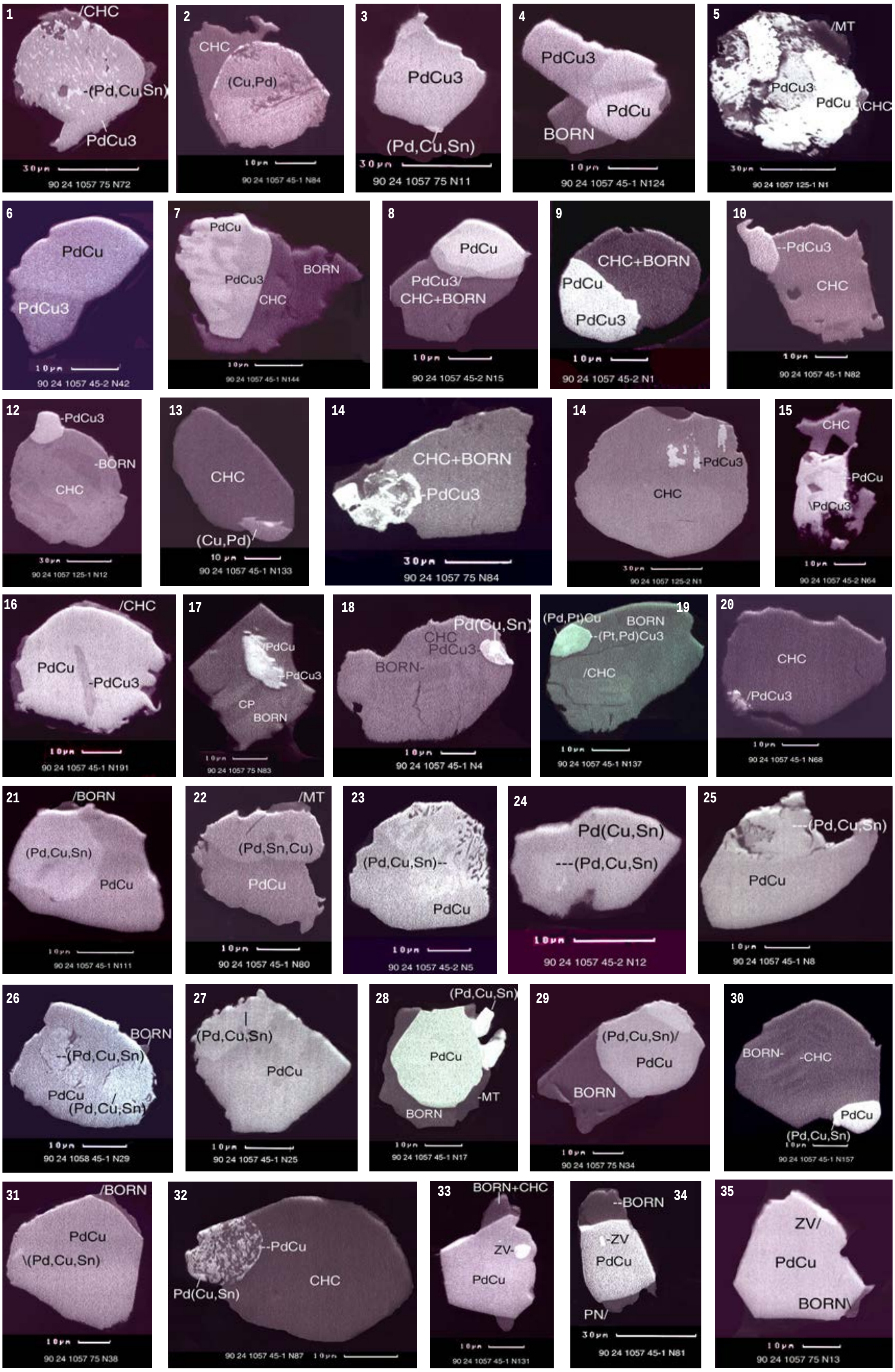

Plate. 6. PGM grains, represented by $PdCu_3$ mineral phase, alloy (Pd,Cu,Sn) and zvyagintsevite (1-35); heavy concentrates of the sample 90-24, 1057; polished section, SEM-image (BIE).

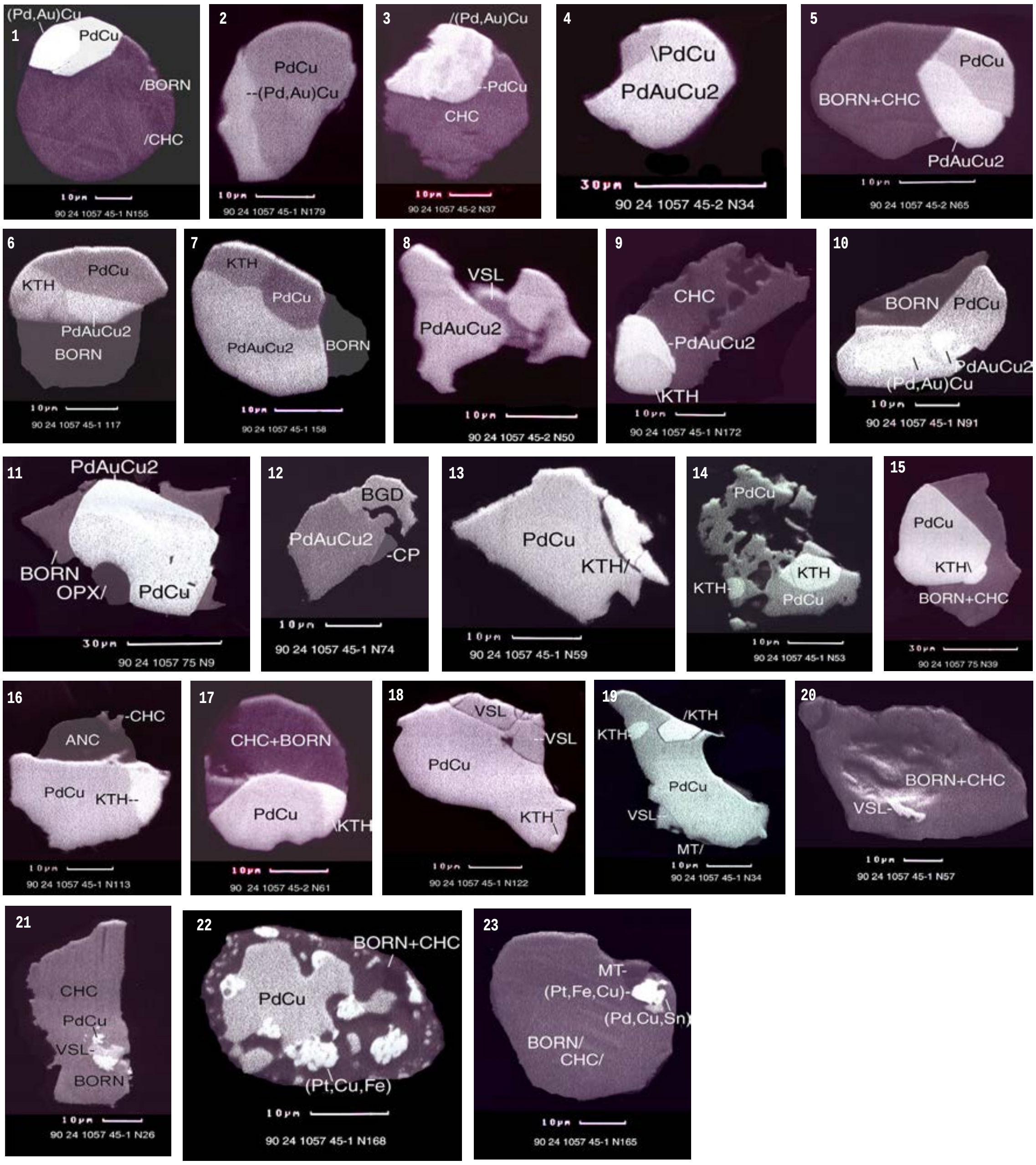

Plate 7. PGM grains, represented by $PdAuCu_2$ mineral phase, bogdanovite, keithconnite, vasilite and Pt-Fe-Cu alloys (1-23); heavy concentrates of the sample 90-24, 1057; polished section, SEM-image (BIE).