Placer diamonds in unconsolidated sands of the Cretaceous Atâne Fm, Disko Island, West Greenland

Stefan Bernstein, Christian Knudsen, Dennis K. Bird & Martin Bruun

GEOLOGICAL SURVEY OF DENMARK AND GREENLAND MINISTRY OF THE ENVIRONMENT



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1. Abstract

A series of small sediment samples (1-2kg/sample) and four larger bulk sediment samples (400-700kg/sample) were taken from Lower Cretaceous, and upper Palaeogene fluvial sediments on eastern Disko and southern Nuussuaq, Northwest Greenland. The sediment samples were analysed for their content of kimberlite indicator minerals and diamonds. Two microdiamonds (<0.1mm) were found, one from a small sediment sample and one from a bulk sample, and both samples from the same stratigraphic package. A total of 11 garnet grains were found, with G9 and G10 compositions, in addition to a number of ilmenite and spinel grains, none of which were of diagnostic kimberlitic composition. The finding of the two microdiamonds and G9-G10 garnets within the sediments suggests that the kimberlitic source rock is found east of Disko Bay area, i. e. on Arveprinsen Ejland, or on the mainland adjacent to or perhaps beneath the ice cap. In the light of the few and small diamonds found, further bulk sampling, preferably in the order of 30-80 tons/sample, is needed to prove or disprove the presence of economic grades of alluvial diamonds on eastern Disko.

2. Introduction and geological background

2.1 Commercial study in the 1970ies

The background for GEUS' initiative in Disko Bay region was the recorded findings of kimberlite indicator minerals in modern stream sediments during private exploration campaigns. In 1977 and 1979, Charter Consolidated carried out a large regional prospecting programme in West Greenland. The programme focused on the collection of sediment samples from streams with subsequent analysis for kimberlite indicator minerals. The results are summarized in Charter Consolidated reports (Brunet, 1977; 1979; Charter Consolidated, 1983), and showed that several streams from eastern Disko, and from the basement rocks east of Disko Bay carry sediments with pyrope garnets of mantle origin (Fig. 1; two locations east of Disko Bay not shown). Out of approximately 50 samples from eastern Disko, each weighing about 30kg, more than 20 samples contained garnets with a clear mantle signature (see below). Charter Consolidated also collected a series of bulk samples. two samples from eastern Disko and two samples from the Precambrian basement area east of Disko Bay. The bulk samples were of 0.75 m3 each, roughly corresponding to a sample weight of 2000kg. These samples were analysed for their diamond contents in addition to indicator minerals. Three of the bulk samples returned mantle garnets, but diamonds were not found in any of the bulk samples. The conclusion drawn by Charter Consolidated was that the ultimate source of the indicator garnets in stream sediments on Disko probably was kimberlites emplaced to the east of Disko Bay, with a secondary source in the Cretaceous sediments on eastern Disko (Brunet, 1979). The low number of indicator garnets (averaging one grain per 30kg sample) and the lack of any diamond findings further led Charter Consolidated to conclude that 'the probability of locating kimberlites or alluvial concentrations of diamonds of economic potential is remote' (Brunet, 1979). Based on the recent compilation indicator mineral data from various companies (Jensen et al., 2004), and sparked by the recent discoveries of diamond bearing kimberlites in central west Greenland it became clear, however, that Disko Bay is the main area outside Sarfartoq-Sisimiut-Maniitsoq region in central west Greenland that show occurrences of indicator garnets with G9-G10 compositions. In 2005, GEUS therefore decided to evaluate the potential for alluvial diamonds on eastern Disko.

2.2 Geological background

The modern streams on eastern Disko drain upper Cretaceous and lower Palaeogene sediments, belonging to the Atane and Atanikerluk Formations, respectively, as well as lower Palaeogene basaltic lavas and sills (Fig. 1). The Atane and Atanikerluk Formations consist of poorly consolidated sandstones deposited in channels in a braided river system. The packages of channel facies sandstone are interleaved with silt and clay rich sediments, often including coal seams, which were deposited in flood plains (Fig. 2). The thickness of the Atane and Atanikerluk Formations together is at least 400m (Pedersen & Jeppesen, 1988; Koppelhus & Pedersen, 1993; Olsen, 1993; Dam et al., 2000; Pedersen et al., 2001).

After Charter Consolidated closed their exploration programmes in the early 1980's, the two outstanding questions were:

1) where is the source(s) of the kimberlite indicator minerals found in the stream sediments located?

2) if the indicator minerals were derived from a secondary source, e. g. the clastic fluvial sediments on Disko, do these sediment host a potential for alluvial diamonds?

In order to test whether the indicator minerals present in eastern Disko have a local origin or perhaps were transported either by ice or by rivers, GEUS initiated a study of the sediments from the Atane and Atanikerluk Formations.



Figure 1. Map of eastern Disko and southern coast of Nuussuaq peninsula. Light green is Atane and Atanikerlug Fm. sandstone, while grey represent early Palaeogene

basaltic lava flows. On Nuussuaq, the yellow colours represent Precambrian basement gneisses (from Garde, 1994). The samples (about 30kg each) taken by Charter Consolidated are represented by circles, coloured after presence of identified indicator garnets (see legend). The two white triangles give the location of two 2000kg bulk samples taken by Charter Consolidated (Charter Consolidated, 1983). GEUS's small sediment samples (app. 1kg each) are taken from profiles shown by purple lines, while GEUS bulk sediment samples are shown by the coloured triangles. The two small sediment samples that yielded three indicator garnets are located in southern Nuussuaq. The one small sediment sample (#486620) that yielded one microdiamond is located at the two GEUS bulk samples #495001 and #495002 (see also Table 1). The one bulk sediment sample in which one microdiamond was found is #495002.



Figure 2. Typical landscape of eastern Disko, with buff-coloured Cretaceous Atane *Fm.* sandstone in the foreground capped by early Palaeogene basaltic lava flows in the distant high region. Photo taken to the NW with the Skansen abandoned settlement situated at the coast in the left side of the photo.

3. GEUS's sampling programme 2005-2006

In 2005 GEUS conducted a collection of samples from the entire stratigraphy of the Atane and Atanikerluk Formations in eastern Disko and southern Nuussuag. 20 samples were taken with approximately stratigraphic intervals of 50m (Table 1) from three sections. Two sections in southern Nuussuag (N8-N28 and C1), and one section from Pingu mountain in northeast Disko (Pingu). Four additional samples from the profile Skansen in southeast Disko, taken during an earlier sampling programme by Martin Bruun, Geological Institute, University of Copenhagen, were also included in the study (see Fig. 1.). These 24 samples are in the following referred to as 'small sediment samples' in contrast to the bulk sediment samples (see below). The small sediment samples were subjected to analysis of their contents of indicator minerals. Each sample weigh 1-2kg and one split of about 500g was sent to SGS Lakefield in Canada. The sample processing is outlined in Appendix C, while the result of the picking of indicator minerals is given in Appendix A. Out of the 24 samples, indicator garnets were found in only two samples, with one and two grains, respectively (see below). In addition, one of the samples, #486620, also contained one microdiamond (app. 0.1mm grain size). As a response to this finding, all remaining material of this sample was subjected to a caustic fusion analysis, which however failed to yield more diamonds (process description in Appendix C and result given in Appendix B).

It was decided to further test the diamond potential of the sediments of the Atane and Atanikerluk Formations by collecting four bulk samples in different parts of Disko. In order to keep expenses at a reasonable level it was decided to process as much material as possible in the field and collect a heavy mineral concentrate of each of the bulk samples. Accordingly, GEUS personnel, aided by helicopter, collected four bulk samples in June 2006. The samples weight range was 400-750kg. Two of the samples, #495001 and #495002, were taken from the stratigraphic package from which the one microdiamond was found in the 2005 sample (sample #486620). Since the operation was restricted to a place that allowed for helicopter landing, the exact location of sample #486620 could not be reached, but the sample sites of the two bulk samples #495001 and #495002 are located within what is believed to be 50m of the stratigraphic location of sample #486620. One sample, #495004 was taken from the coastal cliff close to the sample-processing site established at the former *Skansen* settlement, while the last sample, #495003, was taken about 8km north of *Skansen* (Fig. 1).

Sample ID		weight	weight	Latitude	Longitude	micro	garnet	ilmenite	spinel
			post						
		kg	sieve	North	West	diamond			
			l e m						no.
Drafile C1 at /		/T ortunoa	кд	aa.mm.mmm	aa.mm.mmm	no. grains	no. grains	no. grains	grains
Profile CT at A	Atanikerulu			70.02.400	52 40 770				
486748		1		70.03.469	52.18.770				
486754		1		70.03.682	52.18.550				
486761		1		70.03.777	52.18.563		0		
486767		1		70.03.910	52.18.242		2		
486772		1		70.03.991	52.18.102				
486779		1		70.04.028	52.17.661				
486785		1		70.03.966	52.17.099				l
Profile N8 at F	Kingigtoq					1			
486707		1		70.09.990	52.30.294				
486713		1		70.09.944	52.30.450		1		ļ
486720		1		70.09.891	52.30.585				
Profile N28 at	Kingigtoq	r		1		1	r.	1	n
486722		1		70.09.318	52.31.382				
486727		1		70.09.396	52.31.159				
486732		1		70.09.450	52.31.108				
486739		1		70.09.584	52.30.681				
486745				70.09.653	52.30.422				
Profile at Ping	gu								
486601		1		69.47.483	52.01.469				
486606		1		69.47.856	52.01.586				
486611		1		69.47.272	52.01.640				
486616		1		69.47.185	52.01.665				
486620		1		69.47.167	52.01.827	1			
Profile at Ska	nsen								
122-606		2		69.26.742	52.26.580				
122-619		2		69.27.072	52.27.654				
122-621		2		69.27.078	52.27.672				
122-630		2		69.27.660	52.27.114				
Bulk sedimen	t samples			•					
495001		400	1,13	69.47.165	52.01.624				
495002		600	0,33	69.47.198	52.01.613	1	4	6	1
495003		700	0,91	69.30.013	52.16.317		4	1	
495004		600	3,06	69.26.007	52.25.814				[

Table 1.	Geographical coordinates	s for	samples	collected	for	diamond	indicator	mineral
study, and	result of mineral selection							

4. Processing bulk samples

The four samples were transported to *Skansen* by helicopter sling loads in bigbags (Fig. 3) and a shaking table operation site was established (Fig. 4). With the aid of the build-in 1mm grid, the shaking table allowed material in the fine-grained size fraction <1mm to pass over the table, and a heavy mineral concentrate was collected. The heavy fraction resulting from the first passing of material over the table was in the order of 50kg, which subsequently was processed over again in order to enhance the separation. This resulting heavy fraction weighing between 0.5 and 3kg for the four samples was later dried and sent to SGS Lakefield for further processing.

At SGS Lakefield, the four samples were first split and indicator minerals were picked from a 60g split sample. All remaining material was then subjected to a caustic fusion process according to the description in Appendix C.



Figure 3. Sampling of bulk sediment samples in bigbags, each holding 400-700kg. The loose angular blocks on the outcrop surface are floats from Tertiary basaltic sills higher in the stratigraphic sequence in addition to some well cemented sandstone floats from the Atane or Atanikerluk Formations.



Figure 4. Operation of shaking table at the abandoned Skansen settlement (near bulk sample site #495004; Fig. 1). Heavy mineral fractions were collected in the black buckets, and rerun at the table in order to obtain a good separation, without loosing excessive amount of material from the heavy mineral fraction. With some training, the crew was able to process 50-100kg/hour on the table. The shaking table used is a RP4 from U-Tech, Arizona, USA.

5. Results of the bulk sampling

5.1 Caustic fusion process

The caustic fusion processing yielded one microdiamond in the size fraction 74-105 μ m, weighing 0.006 mg (0.00003 carats), coming from sample #495002. The other three samples, including sample #495001, taken immediately above #495002, failed to yield diamonds.

5.2 Indicator mineral selection

The picking of indicator minerals gave a few purple garnet grains from samples #495002 and #495003. Additionally a series of ilmenite and spinel grains were picked (see Appendix C and Table 1). The picked indicator mineral grains (including the three garnet grains from small sediment samples #486713 and #486767) were mounted in epoxy, polished and carbon coated before the analysis with the JEOL electron microprobe at Geological Institute, University of Copenhagen. All elements were measured by WDS using natural and synthetic standards, with 20s peak count time for Na, Mg, Fe, Si, and Ti, while Cr, Ni, Ca and Al were measured with 40s peak count time. Background count time on either side of peak was half that of peak count time. The analytical results are given in Table 2, Appendix D.

6. Composition of indicator minerals

6.1 Garnet

The compositions of the picked garnet grains from the four samples are given in Fig. 5, in terms of Cr_2O_3 versus CaO. The one garnet grain from small sediment sample #486713 together with the two grains from sample #486767 fall together within the G9 compositional field, i. e. the Iherzolite field after Grütter et al. (2004). Garnets from the bulk sediment samples (four grains in each of the samples #495003 and #495002) mainly fall in the same G9 field, but one grain from each sample fall in the G10 or harzburgite field.



Figure 5. Compositions of picked indicator garnets from small and bulk sediment samples in terms of Cr_2O_3 versus CaO in wt.%. The classification is that of Grütter et al. (2004). Also shown is the compositional range covered by the garnets found by Charter Consolidated (Charter Consolidated, 1983).

6.2 Spinel

Spinel grains were picked from all four bulk sediment samples. The compositions of the spinel grains are shown in Fig. 6 as Cr_2O_3 versus TiO₂. Nearly all analyzed spinel grains fall in the 'overlap field' that does not allow for a distinction between various origins (fields after Grütter & Apter, 1998). None of the spinel grains fall in the 'diamond' field with Cr_2O_3 values above 60 wt.% (red field in Fig. 6), and only one grain from #495003 plot in the possible kimberlite field.



Figure 6. Composition of picked spinel grains from bulk sediment samples in terms of their Cr_2O_3 versus TiO_2 in wt.%. Classification fields after Grütter & Apter (1998).

6.3 Ilmenite

Ilmenite grains were likewise found in all four bulk sediment samples. The composition of the picked ilmenite grains are shown in Fig. 7 as wt.% TiO2 versus wt% MgO. The majority of the ilmenite has compositions that place them in the non-kimberlite field as outlined by Wyatt et al. (2004). A series of grains from sample #495002 and one grain from sample #495003 straddle the division between the non-kimberlite and the kimberlite field.



Figure 7. Composition of picked ilmenite from the bulk sediment samples in terms of their TiO_2 versus MgO in wt.%. Classification after Wyatt et al. (2004).

7. Discussion

The main results of our investigation on Disko-Nuussuaq are the finding of:

- garnets with clear mantle signature (G9-G10) separated from the Atane Formation sediments.
- two microdiamonds in the sediments of the Atane Formation

It is thus evident that our data confirms the Charter Consolidated hypothesis, that the indicator garnets found on Disko are of secondary origin, and that it therefore is unlikely that their original source are kimberlite intrusions on Disko (Brunet, 1979; Charter Consolidated, 1983). Sedimentological studies of the Atane Formation on Disko and on Nuussuaq suggest that these fluvial sediments were deposited by large braided river systems, draining a large area to the east of the present-day Disko Bay, most of which today probably is hidden beneath the ice cap. Proterozoic lamprophyre and lamproite dykes are widespread in the region east of Disko Bay, on Arveprinsens Ejland and further east on the mainland towards the icecap (see Garde & Steenfelt, 1999), and it could be speculated that these form the source, or one of the sources, of indicator minerals and the two microdiamonds on Disko. In this respect it is worth noting that two sediment samples and one bulk rock sample from Arveprinsens Ejland and from Eqi, on the mainland host G9 garnets (Jensen et al., 2004; Charter Consolidated, 1983), thus corroborating the hypothesis of kimberlitic (s.l) intrusives east of Disko.

In terms of the potential for economic alluvial diamond deposits on Disko, it is clear from the distribution of samples with indicator garnets (Fig. 1) that the entire sediment package on Disko have a source or sources in which kimberlites are hosted. Therefore the presence of two microdiamonds is considered significant, and it is regarded unlikely that the finding of two microdiamonds represents contamination at the SGS Lakefield laboratory, since both microdiamonds are found in samples from the same stratigraphic package. Including the samples taken by Charter Consolidated, a total of nearly 8000kg of sediment have been processed, with the total finding of two microdiamonds and about 40 grains of G9-G10 compositions. While the GEUS bulk samples had all of their material coarser than 1mm discarded, Charter Consolidated only discarded material larger than 20mm before visual inspection and further sieving to fraction finer than 3mm. Charter Consolidated then panned all material finer than 3mm, after which the heavy fraction was milled, subsequently separated by heavy liquids and then analyzed for diamond contents (Brunet, 1979). In this light the finding of only two diamonds all together may look somewhat disappointing.

The combined data (G9-G10 garnets and microdiamonds) on the other hand may warrant further exploration in order to evaluate the economic potential of eastern Disko, perhaps by the processing of one order of magnitude more material, i. e. in the order of 30-80 tons.

8. Acknowledgments

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10. Appendices

Appendix A

Result of kimberlite indicator mineral and diamond selection of small sediment samples, by SGS Lakefield, Canada



CERTIFICATE OF ANALYSIS

SGS Minerals Services P.O. Box 4300, 185 Concession Street, Lakefield, Ontario K0L 2H0 Phone: 705-652-2112 Fax: 705-652-3123

Project: 8901-412 Client: Geological Survey of Denmark and Greenland

Date: November 14, 2005 LIMS No: MI1003-OCT05

	Size Fraction					MINE	RALS					
	-60 +100 mesh		PR	P	E	CL	Z	IR	D	IA	INIT	ALS
No.	Sample ID	Sink Weight (g)	Pick 1	QC Pick	Picker	QC Picker						
1	486601	0.73	0	-	0	-	150+	-	0	-	AF	-
2	486606	0.56	0	-	0	-	150+	-	0	-	AF	-
3	486611	0.82	0	0	0	0	150+	-	0	0	MM	EV
4	486616	1.73	0	-	0	-	150+	-	0	-	TM	-
5	486620	0.29	0	0	0	0	150+	-	1	0	ZA	AF
6	486707	0.65	0	0	0	0	150+	-	0	0	TM	AF
7	486713	0.26	0	0	0	0	150+	-	0	0	ТМ	AF
8	486718	0.41	0	-	0	-	150+	-	0	-	TM	-
9	486722	0.17	0	0	0	0	150+	-	0	0	ТМ	EV
10	486727	0.50	0	-	0	-	150+	-	0	-	TM	-
11	486727 QC	0.08	0	-	0	-	7	-	0	-	ТМ	-
12	486732	0.24	0	-	0	-	150+	-	0	-	TM	-
13	486739	0.51	0	0	0	0	150+	-	0	0	TM	AF
14	486746	0.38	0	-	0	-	150+	-	0	-	ТМ	-
15	486748	0.82	0	0	0	0	150+	-	0	0	ТМ	EV
16	486754	1.00	0	-	0	-	150+	-	0	-	AF	-
17	486761	1.69	0	0	0	0	150+	-	0	0	TM	EV
18	486767	1.00	0	-	0	-	150+	-	0	-	TM	-
19	486772	0.04	0	0	0	0	150+	-	0	0	ТМ	AF
20	486779	0.25	0	-	0	-	150+	-	0	-	ТМ	-
21	486785	0.92	0	0	0	0	150+	-	0	0	TM	AF
22	M122-630	1.70	0	-	0	-	150+	-	0	-	ТМ	-
23	M122-630 QC	0.11	0	-	0	-	33	-	0	-	TM	-

Note: The selected grains must be chemically analysed to classify the minerals as diamond indicators.

MINERALS

- PRP PYROPE GARNET
- ECL ECLOGITIC GARNET
- ZIR ZIRCON
- DIA DIAMOND

Hugh DeSouza, Ph.D, P.Geo. Group Leader - Diamond Exploration Services



CERTIFICATE OF ANALYSIS

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Date: November 14, 2005 LIMS No: MI1003-OCT05

	Size Fraction			MINERALS										
	-35 +60 mesh		PR	P	E	CL	Z	IR	D	IA	INIT	IALS		
No.	Sample ID	Sink Weight (g)	Pick 1	QC Pick	Pick 1	QC Pick	Pick 1	QC Pick	Pick 1	QC Pick	Picker	QC Picker		
1	486601	0.11	0	-	0	-	2	-	0	-	AF	-		
2	486606	0.18	0	-	0	-	5	-	0	-	AF	-		
3	486611	0.14	0	0	0	0	1	0	0	0	MM	EV		
4	486616	0.20	0	-	0	-	1	-	0	-	ТМ	-		
5	486620	0.04	0	0	0	0	6	0	0	0	ZA	AF		
6	486707	0.50	0	0	0	0	0	0	0	0	TM	AF		
7	486713	0.07	0	1	0	0	0	0	0	0	ТМ	AF		
8	486718	0.09	0	-	0	-	1	-	0	-	TM	-		
9	486722	0.09	0	0	0	0	1	0	0	0	ТМ	ΕV		
10	486727	0.10	0	-	0	-	1	-	0	-	ТМ	-		
11	486727 QC	0.01	0	-	0	-	0	-	0	-	ТМ	-		
12	486732	0.06	0	-	0	-	3	-	0	-	ТМ	-		
13	486739	0.07	0	0	0	0	1	0	0	0	TM	AF		
14	486746	0.13	0	-	0	-	0	-	0	-	ТМ	-		
15	486748	0.02	0	0	0	0	0	0	0	0	TM	EV		
16	486754	0.19	0	-	0	-	0	-	0	-	AF	-		
17	486761	0.02	0	0	0	0	0	0	0	0	TM	EV		
18	486767	0.40	0	-	0	-	0	-	0	-	TM	-		
19	486772	0.16	0	0	0	0	1	0	0	0	TM	AF		
20	486779	0.05	0	-	0	-	10	-	0	-	TM	-		
21	486785	0.10	0	0	0	0	3	0	0	0	TM	AF		
22	M122-630	0.13	0 -		0	-	1	-	0	-	ТМ	-		
23	M122-630 QC	0.01	0	-	0	-	0	-	0	-	TM	-		

Note: The selected grains must be chemically analysed to classify the minerals as diamond indicators.

MINERALS

- PRP PYROPE GARNET
- ECL ECLOGITIC GARNET
- ZIR ZIRCON
- DIA DIAMOND

Hugh DeSouza, Ph.D, P.Geo. Group Leader - Diamond Exploration Services



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SGS Minerals Services P.O. Box 4300, 185 Concession Street, Lakefield, Ontario K0L 2H0 Phone: 705-652-2112 Fax: 705-652-3123

Project: 8901-412 Client: Geological Survey of Denmark and Greenland

Date: November 14, 2005 LIMS No: MI1003-OCT05

	Size Fraction					MINE	RALS					
	-60 +100 mesh		PR	P	E	CL	Z	IR	D	IA	INIT	ALS
No.	Sample ID	Sink Weight (g)	Pick 1	QC Pick	Picker	QC Picker						
1	486601	0.73	0	-	0	-	150+	-	0	-	AF	-
2	486606	0.56	0	-	0	-	150+	-	0	-	AF	-
3	486611	0.82	0	0	0	0	150+	-	0	0	MM	EV
4	486616	1.73	0	-	0	-	150+	-	0	-	TM	-
5	486620	0.29	0	0	0	0	150+	-	1	0	ZA	AF
6	486707	0.65	0	0	0	0	150+	-	0	0	TM	AF
7	486713	0.26	0	0	0	0	150+	-	0	0	ТМ	AF
8	486718	0.41	0	-	0	-	150+	-	0	-	TM	-
9	486722	0.17	0	0	0	0	150+	-	0	0	ТМ	EV
10	486727	0.50	0	-	0	-	150+	-	0	-	TM	-
11	486727 QC	0.08	0	-	0	-	7	-	0	-	ТМ	-
12	486732	0.24	0	-	0	-	150+	-	0	-	ТМ	-
13	486739	0.51	0	0	0	0	150+	-	0	0	TM	AF
14	486746	0.38	0	-	0	-	150+	-	0	-	ТМ	-
15	486748	0.82	0	0	0	0	150+	-	0	0	ТМ	EV
16	486754	1.00	0	-	0	-	150+	-	0	-	AF	-
17	486761	1.69	0	0	0	0	150+	-	0	0	TM	EV
18	486767	1.00	0	-	0	-	150+	-	0	-	TM	-
19	486772	0.04	0	0	0	0	150+	-	0	0	ТМ	AF
20	486779	0.25	0	-	0	-	150+	-	0	-	ТМ	-
21	486785	0.92	0	0	0	0	150+	-	0	0	TM	AF
22	M122-630	1.70	0	-	0	-	150+	-	0	-	ТМ	-
23	M122-630 QC	0.11	0	-	0	-	33	-	0	-	TM	-

Note: The selected grains must be chemically analysed to classify the minerals as diamond indicators.

MINERALS

- PRP PYROPE GARNET
- ECL ECLOGITIC GARNET
- ZIR ZIRCON
- DIA DIAMOND

Hugh DeSouza, Ph.D, P.Geo. Group Leader - Diamond Exploration Services

Appendix B

Result of diamond test by caustic fusion processing of sample #486620, by SGS Lakefield, Canada



SGS Minerals Services 185 Concession St., Box 4300 Lakefield, Ontario KOL 2H0, CANADA

Tel: (705) 652-2112 Fax: (705) 652-3123

DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Client: Geological Survey of Denmark and Greenland

Date: December 19, 2005 LIMS No. **MI0014-DEC05** Sample No. **486620**

Mesh	Fraction	Dissolution Residue Description
+6	Ferromagnetic Non-mag	Not applicable
-6+20	Ferromagnetic Non-mag	Not applicable
+150	Ferromagnetic Mag	Oxides
-20+150	Ferromagnetic Non-mag (Fus. Res.)	Oxides, silicates, and graphite
-20+150	Paramagnetic Mag (0.3 amp)	Not applicable
-20+150	Diamagnetic Mag (0.5 amp)	Not applicable
-20+150	Diamagnetic Non-mag (0.5 amp)	Not applicable

Sample Weight: 2.30 kg Number of Syndites: 0 Total Weight (carats)*: 0.000 Number of Diamonds: 0

* Total Weight (carats) was calculated from mg weights. All reported mg weights are measured to within 0.002 mg.

Note:

SGS Minerals Services is not responsible for the determination of the origin, quality or value of any diamonds recovered. Each +35 mesh (Tyler sieve; +0.420 mm) stone was individually weighed, and the -35 mesh stones were weighed in groups. Stone dimensions are limited to accuracy of three dimensional measurements of irregular shapes using a petrographic microscope.

Accredited by the Standards Council of Canada to the ISO/IEC Guide 25 standard for specific registered tests.



185 Concession St., Box 4300 Lakefield, Ontario K0L 2H0, CANADA Tel: (705) 652-2112 Fax: (705) 652-3123

DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Client: Geological Survey of Denmark and Greenland

Date: December 19, 2005 LIMS No. **MI0014-DEC05** Sample No. **486620**

	Diamond Size Fractions	Number of Stones in Group	Group Weight (mg)	Group Carats (calculated)
bi V	+ 4.75 mm	0	0.000	0.000
ed ar Juall	- 4.75 / + 3.35 mm	0	0.000	0.000
xribe divic	- 3.35 / + 2.36 mm	0	0.000	0.000
Jesc d Inc	- 2.36 / + 1.70 mm	0	0.000	0.000
es I ghec	- 1.70 / + 1.18 mm	0	0.000	0.000
ston Wei	- 1.18 / + 0.85 mm	0	0.000	0.000
	$-850 / + 600 \ \mu m$	0	0.000	0.000
bed / ed	$-600 / + 425 \ \mu m$	0	0.000	0.000
scri ^l ally eigh	$-425 / + 300 \ \mu m$	0	0.000	0.000
De Vidu Ní	-300 / +212 μm	0	0.000	0.000
nes indiv roul	-212 / +150 μm	0	0.000	0.000
Sto I G	-150 / +105 µm	0	0.000	0.000
	TOTAL	0	0.000	0.000

Sample Weight: 2.30 kg Number of Syndites: 0 Total Weight (carats)*: 0.000 Number of Diamonds: 0

* Total Weight (carats) was calculated from mg weights. All reported mg weights are weighed to within 0.002 mg.

Note:

SGS Minerals Services is not responsible for the determination of the origin, quality or value of any diamonds recovered. Each +35 mesh (Tyler sieve; +0.420 mm) stone was individually weighed, and the -35 mesh stones were weighed in groups.

Accredited by the Standards Council of Canada to the ISO/IEC Guide 25 standard for specific registered tests

P.O. Bag 4300, 185 Concession Street, Lakefield, Ontario K0L 2H0 Phone: 705-652-2112 Fax: 705-652-3123

DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: **8901-412**

Client: Geological Survey of Denmark and Greenland

LIMS No. MI0014-DEC05 Sample No. 486620 Sample Weight: 2.30 kg

No.	Stone	e Dimensio	on, mm	W	eight			Percent	Stone Description
	Х	Y	Z	mg	Carats	Colour	Clarity	Preservation	Morphology
_	+ 4.75	i mm frac	ction	-		-			
0					0.000000				
0				0.000	0.000000	Sub-Total			
	-4.75 /	+ 3.35 m	m fracti	ion	-				
0					0.000000				
0				0.000	0.000000	Sub-Total			
	-3.35 /	+ 2.36 m	m fracti	ion	-				
0					0.000000				
0				0.000	0.000000	Sub-Total			
	-2.36 /	+ 1.70 m	m fracti	ion	-				
0					0.000000				
0				0.000	0.000000	Sub-Total			
	-1.70/	+ 1.18 m	m fracti	ion	-				
0					0.000000				
0				0.000	0.000000	Sub-Total			
	-1.18/	+ 0.85 m	m fracti	ion	-				
0					0.000000				
0				0.000	0.000000	Sub-Total			

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DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: **8901-412**

Client: Geological Survey of Denmark and Greenland

LIMS No. MI0014-DEC05 Sample No. 486620 Sample Weight: 2.30 kg

No.	Stone	Dimensi	on, mm	We	eight			Percent	Stone Description
	Х	Y	Z	mg	Carats	Colour	Clarity	Preservation	Morphology
	-850/+	600 µn	n fractio	า					
0					0.000000				
0				0.000	0.000000	Sub-Total			
	-600/+	425 µn	n fractio	า					
0					0.000000				
0				0.000	0.000000	Sub-Total			
	-425/+	300 µn	n fractio	า					
0					0.000000				
0				0.000	0.000000	Sub-Total			
	-300/+	212 µn	n fractio	า					
0					0.000000				
0				0.000	0.000000	Sub-Total			
	-212/+	150 µn	n fractio	n					
0					0.000000				
0				0.000	0.000000	Sub-Total			
	-150/+	105 µn	n fractio	n					
0					0.000000				
0				0.000	0.000000	Sub-Total			
0					0.000000	TOTAL			

Note 1: Diamond Fragments - No Crystal Faces - Preservation (Resorption) cannot be estimated.

Appendix C

Result of kimberlite indicator mineral selection and diamond test by caustic fusion processing of heavy mineral separates from four bulk sediment samples from eastern Disko, by SGS Lakefield, Canada

KIMBERLITE INDICATOR MINERAL CONCENTRATION AND SELECTION AND MICRODIAMOND EXTRACTION, SELECTION AND DESCRIPTION prepared for

Geological Survey of Denmark and Greenland

8901-412 LIMS#MI1003-SEP06 and MI0043-SEP06 December 22, 2006

NOTE:

This report refers to the samples as received.

The practice of this Company in issuing reports of this nature is to require the recipient not to publish the report or any part thereof without the written consent of SGS Minerals Services.

SGS Lakefield Research Limited P.O. Box 4300, 185 Concession Street, Lakefield, Ontario, Canada K0L 2H0 Tel: (705) 652-2000 Fax: (705) 652-6365 www.sgslakefield.com www.ca.sgs.com

Member of the SGS Group (SGS SA)

Summary

Four samples, identified as 495001 through 495004, were submitted for heavy liquid separation and magnetic separation followed by kimberlite indicator mineral selection. Following indicator mineral selection, the samples were submitted for diamond extraction, selection and description by caustic dissolution.

Method

The samples were submitted for heavy liquid separation (Methylene iodide @ 3.1 g/cc). The float fraction was dried, weighed and stored. The sink fraction was submitted for dry screening at 60 mesh and the -60 mesh material was weighed and stored. The +60 mesh material was submitted for final screening at 35 mesh and magnetic separation (hand-magnet and Frantz electromagnetic separator).

The mineral concentrates were observed with a binocular microscope for the selection of diamond indicator mineral species. A generalised flowsheet for this procedure is given in Appendix 1.

Following kimberlite indicator mineral selection, the mineral concentrates of each sample were recombined with their respective HLS float material and -60 mesh material and submitted for caustic dissolution.

Caustic dissolution residues were collected on a 200 mesh (75 μ m) screen, then submitted for Frantz magnetic separation to isolate the microdiamonds in the non-paramagnetic fraction. All results are reported as a Certificate of Analysis in Appendix 2.

A detailed description of the microdiamond extraction process, as well as a generalized processing flow sheet, may be found in Appendix 3.

As part of our on-going commitment to providing a high quality service and to monitor the recovery efficiency of sample material in each kiln pot, we put spikes in each sample and recovered these spikes at the end of the process during microdiamond selection. The recovery of

coarse, 35 mesh spikes in this group of samples was 98% and the recovery of relatively fine, 80 mesh spikes was 95%.

Results

The results of kimberlite indicator minral selection are given in Appendix 3. All diamond selection results are reported as a Certificate of Analysis in Appendix 4.

A review of the selection results shows that chromite is the most abundant indicator mineral. Some pyrope was identified in all samples except 495001. Rare clinopyroxene and ilmenite were also identified.

Recommendations

Further information about the potential kimberlite sources may be gained by analyzing the selected kimberlite indicator minerals by electron microprobe.

SGS Minerals Services December 22, 2006

Kim Gibbs, H.B.Sc., P.Geo. Mineralogist

Hugh de Souza, Ph.D., P.Geo. Group Leader - Diamond Exploration Services

Sample Processing by: Rob Gill, Wade Pogue, Paul Whitehouse, Jack Hannah, Kim Gibbs and Lisa Gluchowski Diamond Selection by: Teresa Mailath, Wei Guo, Elena Valeyeva, Zakia Al Haddad and Maria Mezei

allezu

Maria Mezei, G.G. (GIA) Diamond Selection Specialist

Appendix 1

KIMBERLITE INDICATOR MINERAL EXTRACTION FLOWSHEET



Diamond Indicator Mineral Extraction Flowsheet

*Primary diamond indicator mineral fractions

Appendix 2

RESULTS OF KIMBERLITE INDICATOR MINERAL SELECTION



P.O. Box 4300, 185 Concession Street, Lakefield, Ontario K0L 2H0 Phone: 705-652-2112 Fax: 705-652-3123

CERTIFICATE OF ANALYSIS

Project: 8901-412

Client: Geological Survey of Denmark and Greenland

Date: November 21, 2006 LIMS No: MI1003-SEP06

	Size Fraction	ı			KIMBERLITE INDICATOR MINERALS												1	
	-35 +60 me	sh	P	RP	E	ECL CPX			11	ILM CHR		OPX		OLI		INITIALS		
No.	Sample ID	Sink Weight (g)	Pick 1	QC Pick	Pick 1	QC Pick	Pick 1	QC Pick	Pick 1	QC Pick	Pick 1	QC Pick	Pick 1	QC Pick	Pick 1	QC Pick	Picker	QC Picker
1	495001	1.32	0	0	0	0	0	0	0	6	0	12	0	0	0	0	ТМ	EV
2	495002	18.19	1	2	0	0	0	0	0	0	8	36	0	0	0	0	WG	EV
3	495003	27.38	0	3	0	0	0	1	0	1	10	20	0	0	0	0	ТМ	EV
4	495004	27.92	0	0	0	0	1	0	0	0	2	15	0	0	0	0	WG	EV

Note: The selected grains must be chemically analysed to classify the minerals as diamond indicators.

MINERALS

PRP PYROPE GARNET

- ECL ECLOGITIC GARNET
- CPX CLINOPYROXENE
- ILM ILMENITE

CHR CHROMITE OPX ORTHOPYROXENE OLI OLIVINE

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Hugh DeSouza, Ph.D, P.Geo. Group Leader - Diamond Exploration Services



P.O. Box 4300, 185 Concession Street, Lakefield, Ontario KOL 2H0 Phone: 705-652-2112 Fax: 705-652-3123

CERTIFICATE OF ANALYSIS

Project: 8901-412

Client: Geological Survey of Denmark and Greenland

Date: November 21, 2006 LIMS No: MI1003-SEP06

	Size Fraction	1	KIMBERLITE INDICATOR MINERALS]		
	-20 +35 me	sh	PI	RP	E	CL	C	РХ	IL	M	C	HR	0	PX	0	LI	INIT	IALS
No.	Sample ID	Sink Weight (g)	Pick 1	QC Pick	Pick 1	QC Pick	Pick 1	QC Pick	Pick 1 QC Pick		Pick 1	QC Pick	Pick 1	QC Pick	Pick 1	QC Pick	Picker	QC Picker
1	495001	0.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	ТМ	ΕV
2	495002	1.22	0	1	0	0	0	0	0	0	0	2	0	0	0	0	WG	EV
3	495003	3.00	1	0	0	0	0	0	0	1	8	0	0	0	0	0	ΤM	ΕV
4	495004	1.50	0												ΤM	ΕV		

Note: The selected grains must be chemically analysed to classify the minerals as diamond indicators.

MINERALS

- PRP PYROPE GARNET ECL ECLOGITIC GARNET
- CPX CLINOPYROXENE
- ILM ILMENITE

CHR CHROMITE OPX ORTHOPYROXENE OLI OLIVINE

Hugh DeSouza, Ph.D, P.Geo. Group Leader - Diamond Exploration Services

Appendix 3

CERTIFICATE OF ANALYSIS RESULTS OF MICRODIAMOND EXTRACTION, SELECTION AND DESCRIPTION

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SGS Lakefield Research Limited P.O. Box 4300 - 185 Concession St. Lakefield - Ontario - KOL 2HO Phone: 705-652-2019 FAX: 705-652-3123

Geological Survey of Denmark and Greenland (GEUS)

Attn : Sven Monrad Jensen, Ph.D/ Stefan Bernstein, Ph.D

Department of Geological Mapping Oster Voldgade 10, DK-1350 - Copenhagen K Denmark Fax :+45 38 14 22 20 Lakefield Thursday, December 21, 2006

Date Rec. :	28 September 2006
LR. Ref. :	MI0043-SEP06
Project :	8901-412

CERTIFICATE OF ANALYSIS

Sample ID	*Caustic Wt kg	*Dia #	*Dia (ct)	*Total pours	
1: 495001	1.13	0	0.000	1	
2: 495002	0.33	1	0.000	1	
3: 495003	0.91	0	0.000	1	
4: 495004	3.06	0	0.000	1	

lillen

Maria Mezei, G.G. (GIA) Diamond Selection Specialist

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SGS Minerals Services 185 Concession St., Box 4300 Lakefield, Ontario KOL 2H0, CANADA

Tel: (705) 652-2112 Fax: (705) 652-3123

DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Date: December 12, 2006

Client: Geological Survey of Denmark and Greenland (GEUS) LIMS No. MI0043-SEP06 Sample No. 495001

Mesh	Fraction	Dissolution Residue Description
+6	Ferromagnetic Non-mag	Not applicable
-6+20	Ferromagnetic Non-mag	Not applicable
+200	Ferromagnetic Mag	Oxides and silicates
-20+200	Paramagnetic Mag (0.1 amp)	Not applicable
-20+200	Paramagnetic Mag (0.3 amp)	Not applicable
-20+200	Diamagnetic Mag (0.5 amp)	Oxides, silicates and graphite
-20+200	Diamagnetic Non-mag (0.5 amp)	Oxides, silicates and graphite

Sample Weight: 1.31 kg Number of Syndites: 0 Total Weight (carats)*: 0.000 Number of Diamonds: 0

* Total Weight (carats) was calculated from mg weights. All reported mg weights are measured to within 0.002 mg.

WeiGue

Selection and Description Wei Guo Mineralogy Technician

EBaces-

Quality Control Elena Valeyeva Mineralogy Technician

Note:

SGS Minerals Services is not responsible for the determination of the origin, quality or value of any diamonds recovered. Each +35 mesh (Tyler sieve; +0.420 mm) stone was individually weighed, and the -35 mesh stones were weighed in groups. Stone dimensions are limited to accuracy of three dimensional measurements of irregular shapes using a petrographic microscope.

Accredited by the Standards Council of Canada to the ISO/IEC Guide 25 standard for specific registered tests.



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Tel: (705) 652-2112 Fax: (705) 652-3123

DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Date: December 12, 2006

Client: Geological Survey of Denmark and Greenland (GEUS) LIMS No. MI0043-SEP06 Sample No. 495001

	Diamond	Number of	Group Weight	Group Carats
	Size Fractions	Stones in Group	(mg)	(calculated)
nd Ily	+ 4.75 mm	0	0.000	0.000
ed a dual	- 4.75 / + 3.35 mm	0	0.000	0.000
cribe divi	- 3.35 / + 2.36 mm	0	0.000	0.000
Des(d In	- 2.36 / + 1.70 mm	0	0.000	0.000
les] ghe	- 1.70 / + 1.18 mm	0	0.000	0.000
Ston Wei	- 1.18 / + 0.85 mm	0	0.000	0.000
V 1	-850 / + 600 μm	0	0.000	0.000
d	-600 / + 425 μm	0	0.000	0.000
bed irouj	-425 / + 300 μm	0	0.000	0.000
scri //G ned	-300 / +212 μm	0	0.000	0.000
De Ially eigł	-212 / +150 μm	0	0.000	0.000
ones vidu W	-150 / +105 μm	0	0.000	0.000
Stc Indi	-105 / + 74 μm	0	0.000	0.000
	- 74 μm	0	0.000	0.000
	TOTAL	0	0.000	0.000

Sample Weight: 1.31 kg Number of Syndites: 0

Total Weight (carats)*: 0.000 Number of Diamonds: 0

* Total Weight (carats) was calculated from mg weights. All reported mg weights are weighed to within 0.002 mg.

WPiGuo

Epaces-

Selection and Description Wei Guo Mineralogy Technician

Quality Control Elena Valeyeva Mineralogy Technician

Note:

SGS Minerals Services is not responsible for the determination of the origin, quality or value of any diamonds recovered. Each +35 mesh (Tyler sieve; +0.420 mm) stone was individually weighed, and the -35 mesh stones were weighed in groups.

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DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

.

Client: Geological Survey of Denmark and Greenland (GEUS)

LIMS No. MI0043-SEP06 Sample No. 495001 Sample Weight: 1.31 kg

NO.	Stone	Dimensio	on, mm	We	eight	İ		Percent	Stone Description
	X	<u> </u>	Z	mg	Carats	Colour	Clarity	Preservation	Morphology
	+ 4.75	mm fra	ction						
0					0.000000				
0	Ĺ			0.000	0.000000	Sub-Tota	l		
	-4.75/	<u>+ 3.35 n</u>	nm frac	tion					
0					0.000000				
0	L			0.000	0.000000	Sub-Tota			
	<u>-3.35 /</u>	+ 2.36 n	nm frac	tion					
0					0.000000				
0				0.000	0.000000	Sub-Tota	l		
	-2.36 /	+ 1.70 n	nm frac	tion					
0					0.000000				
0				0.000	0.000000	Sub-Tota	1		
L	-1.70 /	<u>+ 1.18 n</u>	nm frac	tion					
0					0.000000				
0				0.000	0.000000	Sub-Tota	l		
ļ	<u>-1.18 / ·</u>	<u>+ 0.85 n</u>	nm frac	tion					
0					0.000000				
0				0.000	0.000000	Sub-Total			
L	<u>-850 / +</u>	⊦ 600 µn	n fractio	on					
0					0.000000				
0				0.000	0.000000	Sub-Tota			
L	<u>-600 / +</u>	+ 425 μn	n fractio	on					
0					0.000000				
0				0.000	0.000000	Sub-Tota			

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DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

LIMS No. MI0043-SEP06 Sample No. 495001 Sample Weight: 1.31 kg

Client: Geological Survey of Denmark and Greenland (GEUS)

No.	Stone	Dimensi	on, mm	We	∋ight			Percent	Stone Description		
	Х	Y	Z	mg	Carats	Colour	Clarity	Preservation	Morphology		
	-425 / + 300 μm fraction										
0					0.000000						
0				0.000	0.000000	Sub-Tota	1				
	-300/+	+ 212 μi	m fracti	on							
0					0.000000	Ι					
0				0.000	0.000000	Sub-Tota					
	-212 / +	- 150 μι	m fracti	on							
0					0.000000						
0				0.000	0.000000	Sub-Tota	l				
	<u>-150 / +</u>	- 105 μι	m fracti	on							
0					0.000000						
0				0.000	0.000000	Sub-Tota	ļ				
	-105 / +	· 74 μm	fractio	n							
0					0.000000						
0				0.000	0.000000	Sub-Tota	1				
	- 74 μm	n fractio	on								
0					0.000000						
0				0.000	0.000000	Sub-Tota					
0					0.000000	TOTAL					

Note 1: Diamond Fragments - No Crystal Faces - Preservation (Resorption) cannot be estimated.



SGS Minerals Services 185 Concession St., Box 4300 Lakefield, Ontario KOL 2H0, CANADA

Tel: (705) 652-2112 Fax: (705) 652-3123

DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Date: December 12, 2006

Client: Geological Survey of Denmark and Greenland (GEUS) LIMS No. MI0043-SEP06 Sample No. 495002

Mesh	Fraction	Dissolution Residue Description
+6	Ferromagnetic Non-mag	Not applicable
-6+20	Ferromagnetic Non-mag	Not applicable
+200	Ferromagnetic Mag	Silicates and oxides
-20+200	Paramagnetic Mag (0.1 amp)	Not applicable
-20+200	Paramagnetic Mag (0.3 amp)	Not applicable
-20+200	Diamagnetic Mag (0.5 amp)	Oxides and silicates
-20+200	Diamagnetic Non-mag (0.5 amp)	Silicates, oxides and graphite

Sample Weight: 0.33 kg Number of Syndites: 0 Total Weight (carats)*: 0.000 Number of Diamonds: 1

* Total Weight (carats) was calculated from mg weights. All reported mg weights are measured to within 0.002 mg.

Wei Gué Selection and Description Wei Guo Mineralogy Technician

Bally -

Quality Control Elena Valeyeva Mineralogy Technician

Note:

SGS Minerals Services is not responsible for the determination of the origin, quality or value of any diamonds recovered. Each +35 mesh (Tyler sieve; +0.420 mm) stone was individually weighed, and the -35 mesh stones were weighed in groups. Stone dimensions are limited to accuracy of three dimensional measurements of irregular shapes using a petrographic microscope.

Accredited by the Standards Council of Canada to the ISO/IEC Guide 25 standard for specific registered tests.



SGS Minerals Services 185 Concession St., Box 4300 Lakefield, Ontario KOL 2H0, CANADA

Tel: (705) 652-2112 Fax: (705) 652-3123

DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Date: December 12, 2006

Client: Geological Survey of Denmark and Greenland (GEUS) LIMS No. MI0043-SEP06 Sample No. 495002

	Diamond	Number of	Group Weight	Group Carats
	Size Fractions	Stones in Group	(mg)	(calculated)
nd Ily	+ 4.75 mm	0	0.000	0.000
ed a dua	- 4.75 / + 3.35 mm	0	0.000	0.000
crib	- 3.35 / + 2.36 mm	0	0.000	0.000
Des d In	- 2.36 / + 1.70 mm	0	0.000	0.000
ghe	- 1.70 / + 1.18 mm	0	0.000	0.000
Ston Wei	- 1.18 / + 0.85 mm	0	0.000	0.000
	-850 / + 600 μm	0	0.000	0.000
d	-600 / + 425 μm	0	0.000	0.000
bed	-425 / + 300 μm	0	0.000	0.000
scri //G	-300 / +212 μm	0	0.000	0.000
De Lally eigl	-212 / +150 μm	0	0.000	0.000
ones vidu W	-150 / +105 μm	0	0.000	0.000
Sto Indi	-105 / + 74 μm	1	0.006	0.000
	- 74 μm	0	0.000	0.000
	TOTAL	1	0.006	0.000

Sample Weight: 0.33 kg Number of Syndites: 0 Total Weight (carats)*: 0.000 Number of Diamonds: 1

* Total Weight (carats) was calculated from mg weights. All reported mg weights are weighed to within 0.002 mg.

WPi Gues

Selection and Description Wei Guo Mineralogy Technician

Baus-

Quality Control Elena Valeyeva Mineralogy Technician

Note:

SGS Minerals Services is not responsible for the determination of the origin, quality or value of any diamonds recovered. Each +35 mesh (Tyler sieve; +0.420 mm) stone was individually weighed, and the -35 mesh stones were weighed in groups.

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DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

LIMS No. MI0043-SEP06 Sample No. 495002 Sample Weight: 0.33 kg

Client: Geological Survey of Denmark and Greenland (GEUS)

No.	Stone	Dimensi	ion, mm	W	eight			Percent	Stone Description
	X	<u> </u>	Z	mg	Carats	Colour	Clarity	Preservation	Morphology
	+ 4.75	<u>i mm fra</u>	action						
0					0.000000			1	
0				0.000	0.000000	Sub-Tota	l		
	-4.75/	+ 3.35 /	mm frac	;tion					
0					0.000000			1	
0				0.000	0.000000	Sub-Tota			
	-3.35/	+ 2.36 /	mm frac	;tion					
0					0.000000			1	
0				0.000	0.000000	Sub-Total	<u> </u>		
	-2.36 /	+ 1.70	mm frac	;tion					
0	<u> </u>				0.000000				
0				0.000	0.000000	Sub-Total			
L	-1.70/	<u>+ 1.18 ı</u>	mm frac	tion					
0	L'	<u> </u>		L'	0.000000				
0	L			0.000	0.000000	Sub-Total	1		
<u> </u>	-1.18 /	+ 0.85 r	<u>mm frac</u>	tion					
0	ا <u>ــــــا</u>			<u> </u>	0.000000				
0	l			0.000	0.000000	Sub-Total	i		
L	-850/+	<u>+ 600 µr</u>	<u>m fracti</u>	on					
0	<u> </u>	<u> </u>			0.000000				
0	<u>.</u>			0.000	0.000000	Sub-Total	1		
<u> </u>	-600 / +	<u>+ 425 μr</u>	<u>m fractic</u>	on					
0					0.000000			I	
0				0.000	0.000000	Sub-Total	J		

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Phone: 705-652-2112
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DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Client: Geological Survey of Denmark and Greenland (GEUS)

LIMS No. MI0043-SEP06 Sample No. 495002 Sample Weight: 0.33 kg

No.	Stone	Dimensi	ion, mm	W	eight			Percent	Stone Description			
	Х	Y	Z	mg	Carats	Colour	Clarity	Preservatior	Morphology			
	-425 / + 300 μm fraction											
0					0.000000							
0				0.000	0.000000	Sub-Tota	ıl					
	-300/-	+ 212 µ	m fracti	on								
0					0.000000							
0				0.000	0.000000	Sub-Tota	l					
	-212/-	+ 150 μ	m fracti	ion								
0					0.000000							
0				0.000	0.000000	Sub-Tota	1					
	-150/-	+ 105 μ	<u>m fracti</u>	on								
0					0.000000							
0				0.000	0.000000	Sub-Tota	l					
	-105 / +	+ 74 μm	n fractio	n								
1	0.14	0.11	0.13		0.000000	White	Transparent	99+%	Octahedral, graphite inclusions, partially frosted			
1				0.006	0.000030	Sub-Tota	l					
	<u>- 74 μn</u>	n fracti	on									
0					0.000000							
0				0.000	0.000000	Sub-Tota						
1					0.000030	TOTAL						

Note 1: Diamond Fragments - No Crystal Faces - Preservation (Resorption) cannot be estimated.



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DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Date: December 12, 2006

Client: Geological Survey of Denmark and Greenland (GEUS) LIMS No. MI0043-SEP06 Sample No. 495003

Mesh	Fraction	Dissolution Residue Description
+6	Ferromagnetic Non-mag	Not applicable
-6+20 .	Ferromagnetic Non-mag	Oxides and silicates
+200	Ferromagnetic Mag	Oxides
-20+200	Paramagnetic Mag (0.1 amp)	Not applicable
-20+200	Paramagnetic Mag (0.3 amp)	Not applicable
-20+200	Diamagnetic Mag (0.5 amp)	Silicates and oxides
-20+200	Diamagnetic Non-mag (0.5 amp)	Oxides and silicates

Sample Weight: 0.91 kg Number of Syndites: 0 Total Weight (carats)*: 0.000 Number of Diamonds: 0

* Total Weight (carats) was calculated from mg weights. All reported mg weights are measured to within 0.002 mg.

Selection and Description Elena Valeyeva Mineralogy Technician

Quality Control Maria Mezei Diamond Selection Specialist

Note:

SGS Minerals Services is not responsible for the determination of the origin, quality or value of any diamonds recovered. Each +35 mesh (Tyler sieve; +0.420 mm) stone was individually weighed, and the -35 mesh stones were weighed in groups. Stone dimensions are limited to accuracy of three dimensional measurements of irregular shapes using a petrographic microscope.

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DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Date: December 12, 2006

Client: Geological Survey of Denmark and Greenland (GEUS) LIMS No. MI0043-SEP06 Sample No. 495003

	Diamond	Number of	Group Weight	Group Carats
	Size Fractions	Stones in Group	(mg)	(calculated)
nd Ily	+ 4.75 mm	0	0.000	0.000
ed a dual	- 4.75 / + 3.35 mm	0	0.000	0.000
cribo divi	- 3.35 / + 2.36 mm	0	0.000	0.000
Des d In	- 2.36 / + 1.70 mm	0	0.000	0.000
les] ghe	- 1.70 / + 1.18 mm	0	0.000	0.000
Ston Wei	- 1.18 / + 0.85 mm	0	0.000	0.000
•••	-850 / + 600 μm	0	0.000	0.000
ط	-600 / + 425 μm	0	0.000	0.000
bed	-425 / + 300 μm	0	0.000	0.000
sscri //G ned	-300 / +212 μm	0	0.000	0.000
. De llal cigl	-212 / +150 μm	0	0.000	0.000
ones vidı W	-150 / +105 μm	0	0.000	0.000
Stc Indi	-105 / + 74 μm	0	0.000	0.000
	- 74 μm	0	0.000	0.000
	TOTAL	0	0.000	0.000

Sample Weight: 0.91 kg Number of Syndites: 0 Total Weight (carats)*: 0.000 Number of Diamonds: 0

* Total Weight (carats) was calculated from mg weights. All reported mg weights are weighed to within 0.002 mg.

rey-

Selection and Description Elena Valeyeva Mineralogy Technician

Quality Control Maria Mezei Diamond Selection Specialist

Note:

SGS Minerals Services is not responsible for the determination of the origin, quality or value of any diamonds recovered. Each +35 mesh (Tyler sieve; +0.420 mm) stone was individually weighed, and the -35 mesh stones were weighed in groups.

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DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Client: Geological Survey of Denmark and Greenland (GEUS)

LIMS No. MI0043-SEP06 Sample No. 495003 Sample Weight: 0.91 kg

No.	Stone	Dimensio	on, mm	We	eight	I		Percent	Stone Description
	Х	Y	Z	mg	Carats	Colour	Clarity	Preservation	Morphology
	+ 4.75	mm fra	ction						
0					0.000000				
0				0.000	0.000000	Sub-Tota	l		
	-4.75/	+ 3.35 r	nm frac	tion					
0					0.000000				
0				0.000	0.000000	Sub-Tota	l		
	-3.35/	+ 2.36 r	nm frac	tion					
0					0.000000				
0				0.000	0.000000	Sub-Tota			
	-2.36 / ·	+ 1.70 n	nm frac	tion					
0					0.000000				
0				0.000	0.000000	Sub-Total	[
	-1.70/	+ 1.18 n	nm frac	tion					
0					0.000000				
0				0.000	0.000000	Sub-Total			
	<u>-1.18/-</u>	+ 0.85 n	nm frac	tion					
0					0.000000				
0				0.000	0.000000	Sub-Total			
	<u>-850 / +</u>	· 600 μn	n fractie	on					
0					0.000000				
0				0.000	0.000000	Sub-Total			
	-600 / +	-425 μn	n fractio	on					
0					0.000000				
0				0.000	0.000000	Sub-Total			

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DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Client: Geological Survey of Denmark and Greenland (GEUS)

LIMS No. MI0043-SEP06 Sample No. 495003 Sample Weight: 0.91 kg

No.	No. Stone Dimension, m		ion. mm	W	eiaht	1		Parcent	Stope Departmention
	X	Y	Z	ma	Carats	Colour	Clarity	Preservation	Stone Description
	10E /	200				Looioa	Clarity	Treservation	woi photogy
h., ,	-425/1	<u>r 300 µ</u>	m fracti	on		T			
0		[0.000000				
0				0.000	0.000000	Sub-Tota	l		
L	-300 / +	<u>⊦ 212 μ</u>	m fracti	on					
0					0.000000				
0				0.000	0.000000	Sub-Tota]		
L	-212 / +	+ 150 μ	m fracti	on					
0					0.000000				
0				0.000	0.000000	Sub-Tota	1		
	-150/+	+ 105 μι	m fracti	on					
0					0.000000				
0				0.000	0.000000	Sub-Tota	l		
	-105/+	+ 74 μm	n fractio	n					
0					0.000000				
0				0.000	0.000000	Sub-Tota	I		
	- 74 µm	n fractio	on						
0					0.000000				
0				0.000	0.000000	Sub-Tota			
0					0.000000	TOTAL			

Note 1: Diamond Fragments - No Crystal Faces - Preservation (Resorption) cannot be estimated.



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DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Date: December 21, 2006

Client: Geological Survey of Denmark and Greenland (GEUS) LIMS No. MI0043-SEP06 Sample No. 495004

Mesh	Fraction	Dissolution Residue Description
+6	Ferromagnetic Non-mag	Not applicable
-6+20	Ferromagnetic Non-mag	Oxides and silicates
+200	Ferromagnetic Mag	Oxides and silicates
-20+200	Paramagnetic Mag (0.1 amp)	Not applicable
-20+200	Paramagnetic Mag (0.3 amp)	Not applicable
-20+200	Diamagnetic Mag (0.5 amp)	Oxides and silicates
-20+200	Diamagnetic Non-mag (0.5 amp)	Oxides and silicates

Sample Weight: 3.06 kg Number of Syndites: 0 Total Weight (carats)*: 0.000 Number of Diamonds: 0

* Total Weight (carats) was calculated from mg weights. All reported mg weights are measured to within 0.002 mg.

Selection and Description Zakia Al Haddad Mineralogy Technician

Quality/Control Elena Valeyeva Mineralogy Technician

Note:

SGS Minerals Services is not responsible for the determination of the origin, quality or value of any diamonds recovered. Each +35 mesh (Tyler sieve; +0.420 mm) stone was individually weighed, and the -35 mesh stones were weighed in groups. Stone dimensions are limited to accuracy of three dimensional measurements of irregular shapes using a petrographic microscope.

Accredited by the Standards Council of Canada to the ISO/IEC Guide 25 standard for specific registered tests.



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DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Date: December 21, 2006

Client: Geological Survey of Denmark and Greenland (GEUS) LIMS No. MI0043-SEP06 Sample No. 495004

	Diamond	Number of	Group Weight	Group Carats		
	Size Fractions	Stones in Group	(mg)	(calculated)		
nd Iy	+ 4.75 mm	0	0.000	0.000		
ed ai dual	- 4.75 / + 3.35 mm	0	0.000	0.000		
cribe	- 3.35 / + 2.36 mm	0	0.000	0.000		
Desc d In	- 2.36 / + 1.70 mm	0	0.000	0.000		
es l ghe	- 1.70 / + 1.18 mm	0	0.000	0.000		
Ston Wei	- 1.18 / + 0.85 mm	0	0.000	0.000		
01 -	-850 / + 600 μm	0	0.000	0.000		
d	-600 / + 425 μm	0	0.000	0.000		
bed rouj	-425 / + 300 μm	0	0.000	0.000		
scri · / G ied	-300 / +212 μm	0	0.000	0.000		
De Ially eigh	-212 / +150 μm	0	0.000	0.000		
ones vidu W	-150 / +105 μm	0	0.000	0.000		
Stc Indi	-105 / + 74 μm	0	0.000	0.000		
	- 74 μm	0	0.000	0.000		
	TOTAL	0	0.000	0.000		

Sample Weight: 3.06 kg Number of Syndites: 0 Total Weight (carats)*: 0.000 Number of Diamonds: 0

* Total Weight (carats) was calculated from mg weights. All reported mg weights are weighed to within 0.002 mg.

Selection and Description Zakia Al Haddad Mineralogy Technician

Quality Control Elena Valeyeva Mineralogy Technician

Note:

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DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Client: Geological Survey of Denmark and Greenland (GEUS)

LIMS No. MI0043-SEP06 Sample No. 495004 Sample Weight: 3.06 kg

No.	Stone	Dimensi	on, mm	We	eight	ŀ		Percent	Stone Description
	Х	Y	Z	mg	Carats	Colour	Clarity	Preservation	Morphology
	+ 4.75	mm fra	action						
0					0.000000				
0				0.000	0.000000	Sub-Tota	1		
	-4.75/	+ 3.35 r	nm frac	tion					
0					0.000000				
0				0.000	0.000000	Sub-Tota	I		
[-3.35 /	+ 2.36 r	nm frac	tion					
0					0.000000				
0				0.000	0.000000	Sub-Tota	I	-	
	-2.36 /	+ 1.70 r	nm frac	tion					
0					0.000000				
0				0.000	0.000000	Sub-Tota	1		
	-1.70 /	+ 1.18 r	nm frac	ction					
0					0.000000				
0				0.000	0.000000	Sub-Tota			
	-1.18/	+ 0.85 r	nm frac	tion					
0					0.000000				
0				0.000	0.000000	Sub-Tota	l		
	-850/+	+ 600 μr	n fracti	on					
0					0.000000				
0				0.000	0.000000	Sub-Tota			
	-600 / + 425 µm fraction								
0					0.000000				
0				0.000	0.000000	Sub-Tota			

December 21, 2006

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Fax: 705-652-3123

DIAMOND RECOVERY BY CAUSTIC DISSOLUTION

Project: 8901-412

Client: Geological Survey of Denmark and Greenland (GEUS)

LIMS No. MI0043-SEP06 Sample No. 495004 Sample Weight: 3.06 kg

1		<u> </u>			• • •	1		T =	
NO.	Stone	Dimensi	on, mm	We	eight			Percent	Stone Description
	Х	Y	Z	mg	Carats	Colour	Clarity	Preservation	Morphology
	-425/+	⊦ 300 µI	m fracti	on					
0					0.000000				
0				0.000	0.000000	Sub-Tota			
	-300/+	+ 212 µ	m fracti	on					
0					0.000000				
0				0.000	0.000000	Sub-Tota	l		
	-212/+	+ 150 μi	m fracti	on					
0					0.000000				
0				0.000	0.000000	Sub-Tota	l		
	-150/+	- 105 μι	m fracti	on					
0					0.000000				
0				0.000	0.000000	Sub-Tota			
	-105/+	- 74 μm	fractio	n					
0					0.000000				
0				0.000	0.000000	Sub-Tota			
	- 74 µn	n fractio	on						
0					0.000000				
0				0.000	0.000000	Sub-Tota			
0					0.000000	TOTAL			

Note 1: Diamond Fragments - No Crystal Faces - Preservation (Resorption) cannot be estimated.

Appendix 4

EXPLANATION OF MICRODIAMOND EXTRACTION AND SELECTION PROCEDURE AND FLOWSHEET

Introduction

Caustic dissolution of exploration samples efficiently produces a concentrate from which diamonds can readily be extracted during microscopic examination. The process takes advantage of diamond's property of high resistance to caustic soda (NaOH), eliminating diamond size reduction and loss that often occurs during extraction procedures that rely on crushing and attrition milling.

Procedure

The samples are processed according to the attached flowsheet. Very few minerals survive the harsh chemical attack, therefore weight reductions commonly exceed 99% of the initial sample weight.

As-received samples are divided into equally sized charges of less than 8 kg. Smaller charge sizes are necessary if the sample contains a high proportion of carbonate minerals, which are vigorously reactive with NaOH (the carbonate content is evaluated by an acid test prior to charge preparation). If a high proportion of the sample is composed of fragments larger than 8 cm, simple breakage, crushing or attrition milling may be required for an effective dissolution, or the length of the dissolution process may be increased. Client consultation and approval is necessary before any size reduction of the sample is initiated.

After digestion in molten caustic soda, the sample is poured onto a large-diameter 150 mesh (100 μ m) screen. The + 150 mesh residue is liberated from the NaOH by washing the sample in a series of water and acid leach (HCl) baths. Once all of the NaOH is dissolved and removed, the concentrate is dried and screened on a 6 mesh screen to remove undigested material. The undigested material is examined microscopically by a mineralogist. If a significant amount of +6 mesh remains, or if the material consists of possible diamondiferous rock fragments, further digestion may be required. If the undigested material is of insignificant size or not considered as a possible source of diamonds, the -6 mesh residue is further processed by a two (possibly three if the residue is large) stage magnetic separation procedure utilising a permanent magnet and a Frantz Barrier Magnetic Separator.

The magnetically characterised residue is then submitted for microscopic examination and diamond selection. In addition to diamonds, the residue may contain partially undigested indicator minerals, colourless to opaque spinel, garnet, ilmenite, graphite, moissanite, zircon and kyanite. Each of the magnetic fractions is examined at a magnification of 40x using a binocular microscope. Grains of questionable mineralogy are examined using a scanning electron microscope equipped with an energy dispersive spectral (SEM-EDS) analyser. Although each magnetically characterised fraction is examined, particular emphasis is given to the diamagnetic portion.

The X, Y and Z dimensions of selected microdiamonds are measured in millimetres. Macrodiamonds are weighed individually while microdiamonds are weighed in groups by size fraction, with the milligram weight, in each case, converted to carats. The colour, clarity and morphology of each diamond are determined and all observations reported in a Certificate of Analysis. Synthetic diamonds released into a sample by diamond drill bits are selected and reported as "syndites" on the diamond description sheet.

Quality Control

Routine quality control tests are utilized to evaluate the efficiency of the caustic dissolution processing technique, by spiking client samples with two sizes (35 mesh and 80 mesh) of synthetic diamonds (easily identifiable, colour treated diamond fragments. Recovery of the diamond spikes typically ranges from 97 to 100%, and for 2005 was 96% for the coarse spikes and 94% for the fine spikes. Further, 2002 statistics showed that an average of 1.18 indicator mineral grains (73% of which were oxides, 27% silicates) were carried over into the caustic soda blanks run between different client's samples.

Each caustic dissolution residue is picked twice by separate diamond pickers. Questionable grains are examined by SEM-EDS for verification.

Every effort is made at each stage of sample handling during caustic dissolution, residue preparation and diamond picking to eliminate the possibility of contamination. These steps include:

- A rigorous sample tracking procedure.
- Dedicated screens and equipment for each sample during sample processing.
- Replacement of screens between each sample after pouring caustic soda.
- Thorough washing and scrubbing of all sample containers.
- Thorough cleaning of equipment used to prepare caustic residues between each processed sample.
- Sandblasting of each kiln pot between clients projects to ensure the removal of any microdiamonds or indicator minerals.

Customized flowsheets for sample processing utilising caustic dissolution and other sample preparation techniques (magnetic, gravity, flotation, acid leaching, etc.) can be developed, in consultation with the client, to meet specialised requirements.

SGS Lakefield Research Limited is not responsible for the determination of the origin, quality or valuation of any diamonds recovered unless otherwise instructed by the client.



Caustic Dissolution for Microdiamond Recovery

Appendix D

Table 2: Result of kimberlite indicator mineral compositions from four bulk sediment samples from eastern Disko, by electron microprobe analyses

 Table 2 Composition of indicator mineral grains as selected by SGS Lakefield, part 1
 Garnets

SampleID	Al203	MnO	TiO2	Cr203	Na2O	SiO2	FeO	NiO	MgO	CaO	K20	Total
495002	22.15	.42	.16	2.53	.05	42.40	8.31	.01	20.20	4.37	.00	100.31
495002	21.01	.48	.18	4.02	.04	41.78	8.22	.06	19.59	5.52	.00	100.59
495002	18.01	.32	.02	8.53	.03	42.25	6.41	.00	22.17	3.67	.01	101.15
495002	19.31	.48	.24	6.23	.05	42.20	6.88	.00	21.31	4.21	.01	100.65
495003	18.55	.50	.22	6.95	.07	41.90	8.06	.00	19.12	5.61	.01	100.68
495003	20.38	.41	.28	4.58	.04	42.31	6.56	.00	21.56	5.13	.01	100.97
495003	21.46	.46	.00	4.18	.01	43.15	7.45	.01	22.16	2.72	.02	101.38
495003	20.71	.39	.17	4.41	.06	41.85	6.98	.00	21.13	4.73	.00	100.16
486713	20.13	.35	.97	2.94	.07	42.13	8.31	.01	20.95	4.97	.00	100.91
486767	20.28	.48	.01	4.84	.03	40.49	7.46	.00	20.74	4.54	.00	98.92
486767	20.97	.40	.13	4.17	.02	42.35	7.71	.00	20.25	5.26	.00	101.32

Table 2, part2 Ilmenite

SampleID	Al2O3	MnO	TiO2	Cr2O3	Na2O	SiO2	FeO	NiO	MgO	CaO	К2О	Total
495001	.03	.61	51.61	.21	.06	.01	44.18	.01	.41	.00	.00	97.35
495001	.04	.67	48.44	.06	.00	.00	49.84	.09	.61	.00	.01	100.01
495001	.22	1.28	43.79	.04	.00	.01	49.59	.00	3.10	.00	.02	98.31
495001	.07	.44	51.71	.05	.03	.14	45.36	.00	.22	.00	.02	98.28
495001	.03	.42	48.14	.06	.00	.03	50.42	.02	.55	.00	.00	99.92
495001	.00	.35	53.00	.15	.00	.03	45.07	.00	1.41	.00	.00	100.26
495001	.15	.99	57.44	.07	.00	.26	35.70	.02	.08	.06	.01	94.95
495001	.15	.95	56.49	.05	.00	.26	35.43	.01	.04	.08	.00	93.63
495001	.21	.94	57.43	.13	.07	.24	36.35	.00	.06	.05	.00	95.65
495001	.13	.72	51.41	.03	.10	.27	43.75	.00	.15	.03	.07	96.88
495001	.26	.83	56.59	.01	.02	.24	36.81	.01	.66	.00	.00	95.61
495001	.04	.80	51.85	.07	.00	.07	46.24	.06	.38	.00	.00	99.73
495001	.08	1.13	49.64	.05	.05	.00	49.10	.08	.07	.00	.01	100.47
495001	.00	.83	50.33	.25	.00	.00	48.51	.00	.52	.00	.01	100.68
495001	.03	.58	50.34	.00	.03	.02	46.71	.00	.41	.00	.01	98.36
495001	.02	.32	48.70	.00	.04	.00	49.64	.03	.28	.00	.00	99.27
495001	.01	.64	50.53	.21	.00	.00	47.67	.00	.52	.00	.00	99.82
495002	.09	1.99	50.82	.05	.00	.14	46.37	.00	.05	.00	.00	99.75
495002	.36	.32	51.25	1.52	.04	.00	35.24	.05	10.89	.02	.00	99.92
495002	.04	.31	51.40	.00	.01	.03	45.41	.05	.58	.00	.01	98.07
495002	.00	1.16	51.20	.00	.07	.00	47.93	.01	.23	.00	.02	100.86
495002	.00	.38	51.34	.05	.00	.01	46.94	.00	1.06	.00	.00	100.03
495002	.05	.50	48.81	.01	.03	.01	50.95	.02	.25	.00	.00	100.89
495002	.01	2.75	52.48	.03	.00	.00	44.65	.00	.01	.00	.00	100.15
495002	.00	.78	51.87	.08	.03	.04	48.14	.00	.26	.00	.00	101.44
495002	.05	.09	54.65	.01	.07	.07	43.71	.03	1.19	.02	.01	100.12
495002	.00	.33	51.45	.04	.00	.00	48.22	.00	.35	.00	.00	100.63
495003	.10	.40	50.01	.17	.00	.06	40.52	.08	7.61	.00	.00	99.18
495003	.18	.41	52.33	.30	.00	.00	38.32	.07	9.20	.00	.00	101.04
495003	.13	.36	50.81	.21	.00	.02	41.73	.00	7.58	.00	.00	101.09
495003	.14	.32	49.18	.21	.02	.00	40.55	.03	7.67	.00	.00	98.37
495003	.23	.38	51.69	1.23	.02	.01	34.88	.10	10.10	.00	.00	98.88
495003	.64	.47	58.58	.02	.07	.78	33.54	.00	.12	.00	.00	94.38
495003	.05	.55	50.75	.05	.00	.07	48.92	.00	.22	.00	.00	100.86
495003	.08	2.41	52.23	.03	.03	.08	41.91	.00	.44	.02	.00	97.44

495003	.42	.36	49.95	.63	.00	.01	37.08	.12	11.23	.00	.02	100.06
495004	2.00	.38	66.81	.11	.04	.76	24.11	.02	.23	.10	.01	94.69
495004	.11	.37	47.48	.01	.01	.05	49.97	.05	1.40	.00	.00	99.72
495004	.04	.47	49.87	.05	.00	.00	49.66	.00	.46	.00	.00	100.80
495004	.01	1.37	46.52	.02	.00	.04	52.05	.00	.03	.00	.01	100.31
495004	.05	.34	46.13	.08	.00	.02	51.75	.00	1.03	.00	.00	99.66
495004	.00	.90	51.18	.07	.01	.02	47.48	.02	.27	.00	.00	100.20
495004	.00	.50	49.19	.07	.01	.00	48.51	.02	.69	.00	.01	99.24

Table 2, part3 Spinel (chromite)

SampleID	Al203	MnO	TiO2	Cr203	Na2O	SiO2	FeO	NiO	MgO	CaO	K20	Total
495001	17.75	.27	1.34	46.35	.04	.15	20.74	.15	14.69	.00	.00	101.64
495001	19.46	.37	.13	39.86	.04	.05	31.53	.14	8.82	.00	.01	100.62
495002	19.15	.44	.84	44.13	.04	.00	28.99	.04	7.84	.00	.02	101.68
495002	24.88	.38	.23	42.46	.02	.06	23.01	.05	11.04	.02	.00	102.31
495002	27.85	.46	.05	35.16	.02	.00	34.51	.09	3.61	.00	.00	101.95
495002	22.28	.39	.21	40.00	.01	.01	29.29	.13	9.12	.00	.00	101.63
495002	4.98	.51	2.92	52.49	.03	.03	29.52	.13	10.15	.00	.01	100.97
495002	31.48	.34	.13	31.77	.01	.00	25.30	.19	12.05	.00	.00	101.46
495002	31.40	.30	.04	33.74	.01	.03	29.24	.18	5.66	.00	.01	100.78
495002	23.62	.53	.05	37.42	.03	.04	37.15	.07	2.66	.00	.00	101.76
495002	22.58	.41	.38	45.28	.03	.00	22.79	.13	10.61	.00	.00	102.37
495002	16.42	.51	.28	54.58	.02	.02	20.38	.03	9.82	.00	.00	102.22
495002	12.52	.48	1.34	43.03	.04	.12	38.37	.16	2.95	.00	.02	99.24
495002	4.43	.87	.12	53.07	.02	.03	39.03	.03	2.97	.00	.00	100.77
495002	15.14	.52	.11	43.48	.02	.00	33.71	.12	7.70	.00	.00	101.02
495002	23.80	.58	.09	29.93	.05	2.10	36.73	.08	1.80	.01	.13	95.46
495002	20.09	.44	1.28	43.00	.02	.00	26.97	.13	8.83	.00	.00	100.94
495002	16.83	1.07	.19	43.06	.03	.04	39.50	.00	.67	.00	.00	101.60
495002	30.80	.44	.28	33.70	.02	.03	28.04	.13	8.59	.00	.00	102.21
495002	26.35	.41	.16	34.88	.00	.01	33.81	.13	6.24	.00	.01	102.19
495002	33.19	.39	.04	29.48	.01	.07	33.23	.07	4.34	.00	.00	101.01
495002	21.96	.57	.28	38.25	.04	.02	29.52	.18	10.71	.00	.00	101.73
495002	6.97	.55	.34	48.16	.03	.00	36.20	.20	8.76	.00	.02	101.44
495002	20.19	.37	.15	47.90	.00	.05	22.23	.09	10.19	.00	.00	101.34
495002	14.07	.55	.04	50.85	.05	.04	30.96	.03	5.09	.00	.02	101.90
495002	13.73	.55	.19	46.91	.03	.04	35.26	.06	4.31	.00	.00	101.29
495002	19.35	.47	.22	41.29	.11	.01	32.85	.14	6.17	.00	.00	100.81
495002	27.22	.36	.06	38.64	.04	.91	28.68	.07	3.50	.08	.01	99.72
495002	15.03	.43	1.11	42.67	.05	.00	35.03	.10	6.48	.00	.00	101.11
495002	35.08	.27	.01	31.46	.03	.00	20.06	.19	14.76	.00	.00	102.02
495002	16.57	.49	.95	34.54	.05	.01	34.37	.02	5.35	.02	.04	92.62
495002	15.18	.37	.88	40.93	.00	.25	34.36	.09	6.69	.00	.00	98.94
495002	12.00	.57	.11	53.14	.00	.45	30.55	.00	3.38	.00	.00	100.36
495002	56.64	.09	.03	9.74	.04	.01	17.39	.39	16.36	.03	.02	100.91
495002	16.23	.40	.27	54.98	.04	.03	19.30	.05	10.59	.01	.00	102.03
495002	16.08	.35	.18	54.87	.01	.03	19.54	.14	10.75	.00	.00	102.09
495003	24.63	.74	.02	38.32	.01	.08	35.25	.02	3.01	.00	.00	102.28
495003	23.66	.39	.19	36.85	.00	.00	33.12	.13	6.93	.00	.00	101.46
495003	15.24	.87	.29	45.91	.00	.01	28.22	.17	9.73	.00	.00	100.62
495003	14.23	.71	.08	51.55	.02	.01	28.88	.03	6.52	.00	.00	102.20
495003	13.29	.39	.13	49.82	.04	.01	32.46	.08	4.67	.00	.00	101.08

495003	15.13	.43	.09	45.74	.01	.00	31.85	.11	6.88	.00	.02	100.43
495003	32.13	.37	.03	30.03	.11	.27	34.09	.03	4.55	.00	.01	101.81
495003	2.27	1.51	.83	49.33	.09	.03	41.66	.12	2.56	.00	.00	98.62
495003	18.15	.73	.06	39.81	.05	.78	37.28	.05	3.11	.00	.03	100.25
495003	19.89	.33	.28	52.84	.01	.04	16.42	.11	11.65	.00	.01	101.71
495003	16.16	.73	.77	41.30	.07	.01	39.62	.12	1.70	.00	.00	100.68
495003	18.68	.42	.20	53.60	.02	.07	17.88	.04	11.48	.00	.00	102.53
495003	28.06	.32	.34	34.62	.04	.03	30.78	.11	7.35	.00	.00	101.84
495003	28.85	.65	.08	31.31	.09	.48	37.00	.12	3.24	.00	.07	102.09
495003	28.78	.42	.27	33.43	.02	.00	30.77	.14	8.17	.00	.00	102.18
495003	15.33	.99	.16	42.68	.06	.03	39.75	.08	1.62	.00	.00	100.89
495003	19.45	.37	.70	45.45	.03	.03	26.82	.15	9.02	.00	.00	102.19
495003	13.44	.35	.06	54.13	.00	.22	21.29	.11	8.97	.00	.00	98.73
495003	31.62	.41	.03	30.78	.06	1.80	30.69	.04	5.55	.75	.03	101.93
495003	16.37	.61	.30	52.89	.00	.03	25.11	.07	6.68	.00	.01	102.23
495003	16.77	.32	.20	55.04	.03	.04	17.85	.07	11.16	.00	.02	101.64
495003	11.52	.38	.13	44.18	.00	.01	37.51	.13	4.21	.00	.03	98.31
495003	19.76	.57	.28	51.53	.03	.03	19.86	.06	10.71	.00	.00	102.97
495003	36.85	.43	.03	28.29	.01	.00	29.45	.03	7.14	.00	.00	102.41
495003	4.55	1.71	.08	51.88	.01	.02	40.66	.05	.93	.00	.00	100.09
495003	27.14	.61	.07	33.68	.04	.03	37.03	.08	3.08	.00	.00	101.96
495003	10.43	.45	.29	47.54	.04	.97	30.53	.12	4.85	.05	.00	95.43
495003	18.93	.61	.76	48.27	.02	.00	25.60	.00	6.50	.00	.00	100.86
495004	16.82	.67	1.85	40.67	.07	.02	36.86	.25	4.29	.00	.00	101.71
495004	12.42	.43	.33	40.61	.02	.03	41.04	.20	5.07	.00	.00	100.38
495004	17.17	.47	.34	50.26	.02	.03	25.65	.08	7.79	.00	.00	101.98
495004	11.51	.50	.20	53.41	.04	.02	28.27	.06	6.81	.00	.01	101.00
495004	26.95	.42	.01	34.61	.00	.00	36.23	.01	3.05	.00	.00	101.48
495004	11.14	.68	.15	43.38	.00	.00	40.29	.14	4.82	.00	.00	100.82
495004	17.68	.34	.59	39.49	.04	.02	36.27	.02	5.34	.00	.00	100.00
495004	18.66	.49	.40	44.16	.01	.02	30.50	.06	7.09	.00	.00	101.58
495004	25.31	.46	.98	36.60	.01	.01	32.71	.06	5.20	.02	.00	101.54