DREDGE SAMPLE LOG

			JD	LOCAL
CRUISE	KODOS97-4	DATE	236	8 25 97
STATION	1		GMT	LOCAL
DREDGE	D2	TIME	2102-2223	0902-1023
DEPTH INTERVAL(m)	1692-1732	LATITUDE (N,S)	on bottom 09° 24.60	off bottom 09° 24.95
DEPTH(m) CORRECTED	~~1610-2182~~ 1725-1650	LONGITUDE (E,W)	166° 03.10	166° 03.49

TOTAL WEIGHT : DREDGE 28 Kg CRUST 28 Kg

%OF ROCK COVERED BY CRUST 100%

%BROKEN FROM : OUTCROP 100% TALUS ϕ

THICKNESS OF CRUST : MAX 7 cm MIN 2 cm AVG 4 cm

DOMINANT SURFACE TEXTURE botryoidal, smooth edges

SUBSTRATE LITHOLOGY volcanic breccia with CFA cement
*(carbonate fluorapatite)

NODULES PRESENT ϕ

REMARKS:

KODOS 97-4 D2

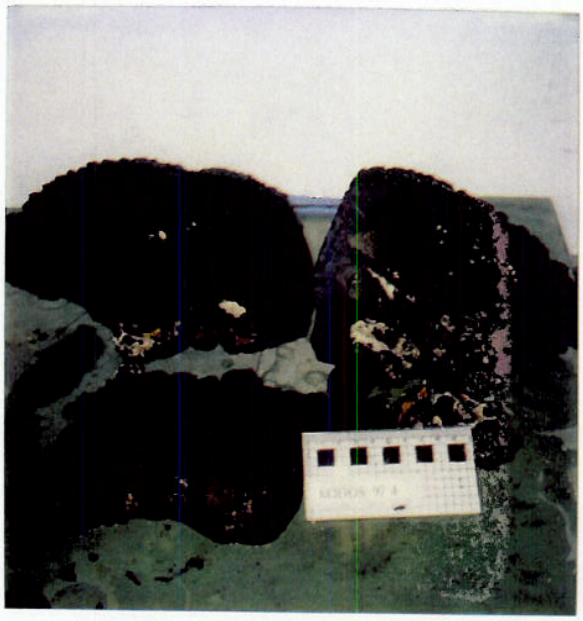
Dredge Sample Summary Sheet

Sample ID	Bulk CC	Layer CC	Pt & Au	FEE	CC	~~DPTS/TS~~ PTS	XRD	35mm Photo	Archive	Paleo	Powders Pu Ec
D2-1A	✓		✓	✓		✓	✓				10g
D2-1B		✓ (layer1)		✓			✓				
D2-1C		✓ (layer2)		✓			✓				
D2-1D		✓ (layer3)	✓	✓			✓				
D2-1E		✓ (layer4)	✓	✓			✓				
D2-1F										✓	
D2-2									✓		
D2-3									✓		
D2-4A	✓			✓			✓				10g
D2-5									✓		
D2-6A	✓			✓			✓				10g
D2-6B		✓ (layer1)		✓			✓				
D2-6C		✓ (layer2)		✓			✓				
D2-6D		✓ (layer3)		✓			✓				
D2-7									✓		
D2-8									✓		
D2-9									✓		
D2-10									✓		
D2-11									✓		
D2-12									✓		
D2-13									✓		

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 **Size(cm):** 27cm x 9cm x 1cm **Location:** R1

Sample Id: D2-1 **Weight(kg):** 6.3kg **Depth(m):** 1725-1650



D2-1
KODOS 97-4

Mn Crust Description

Surface Texture: Botryoidal, granular on sides

Mn Crust Thickness(mm):

Min: 45 Max: 80 Ave: 65

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	5	10	7	massive / black
2	10	15	10	porous / black
3	25	55	45	black / massive w/ CFA
4				filled vugs close to top
5				
6				

Comments and XRD Mineralogy:

Fractal Surface

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D2-1A	PGE, Bulk CC	0-70mm	~60g
D2-1B	CC	layer 1 0-10	~50g
D2-1C	CC	layer 2 10-25	~25g
D2-1D	PGE CC	layer 3 25-45	~75g
D2-1E	PGE CC	layer 4 45-70	~65g
D2-1F	Poleo	Substrate	
D2-1A	PTS		

70% KORDI
30% USGS

~10g of D2-1A (Powder) to KORDI
(we have ~50g left)

Substrate Description

RockType: Red-Brown Breccia w/ yellow phosphorite cement + Mn oxide cement + Clasts = fresh to altered Basalt + older Breccia fragments, all surrounded by Mn-oxides

Description:

Biology: NONE

Described by: Leanne Roberts

Subsampled by: HEIN

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 **Size(cm):** 18cm×24cm×10cm **Location:** R1

Sample Id: D2-2 **Weight(kg):** 3.75cm **Depth(m):** 1725-1650

D2-2
KODOS 97-4

Mn Crust Description

Surface Texture: modified botryoidal
large vugs caused by erosion
from currents

Mn Crust Thickness(mm):

Min: 75 Max: 90 Ave: 85

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	5	10	8	massive black
2	15	20	17	red+black porous
3	50	65	60	black massive w/
4				CFA filled vugs in
5				uppermost portion
6				

Comments and XRD Mineralogy:

3 distinct layers

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
—			

50% HORDI
50% USGS

Substrate Description

RockType: clast from altered Breccia

Description: Breccia red-brown
highly altered - minor CFA
cement

.ology: encrusting forams on surface

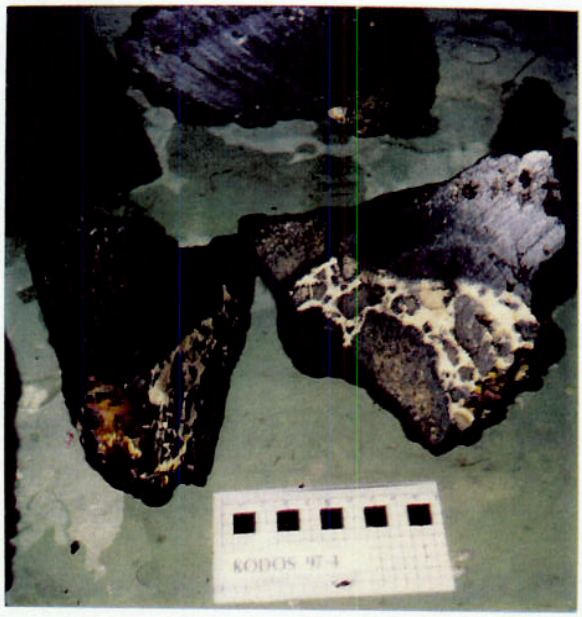
Described by: Leanne Roberts

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 16cm x 16cm x 13cm Location: R1

ample Id: D2-3 Weight(kg): 2.8Kg Depth(m): 1725-1650



D2-3
KODOS 97-4

Mn Crust Description

Surface Texture: surface layer not recovered

Mn Crust Thickness(mm):

Min: _____ Max: _____ Ave: 65mm

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	2		25	red-black porous
2	35	40	37	massive black
3				
4				
5				
6				

Comments and XRD Mineralogy:

2 layers

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
2			
	60% HORDI		
	40% USGS		

Substrate Description

RockType: Breccia

Description: clast are highly altered basalt with Mn-oxide rims
cement is phosphorite + Mn oxide
some other phosphorite clasts

ology: NONE

Described by: Leanne Roberts

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 16cm x 15cm x 11cm Location: R1

Sample Id: D2-4 Weight(kg): 3.8 Kg Depth(m): 1725-1660

D2-4
KODOS 97-4

Mn Crust Description

Surface Texture: Botryoidal on top
Granular on sides

Mn Crust Thickness(mm):

Min: 35 Max: 70 Ave: 55

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	2	9	5	massive black
2	10	20	15	porous black
3	25	45	35	massive black w/
4				unfilled vugs ~~on~~ top
5				(near)
6				

Comments and XRD Mineralogy:

looks to be an old surface, smoothed slightly

Substrate Description

RockType: Breccia

Description: Clasts Red Brown surrounded by Mn-oxides, Phosphorite cement binds Breccia together consisting of 3 lg Clasts: altered Basalt = 2
Phosphorite = 1, each w/ accreted Mn layers + all then cemented w/ Mn + CFA

ology: Encrusting forams on surface

Described by: Leanne Roberts

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
D2-4A	CC	BULK 0-65mm	100g

40% USGS
60% KORDI

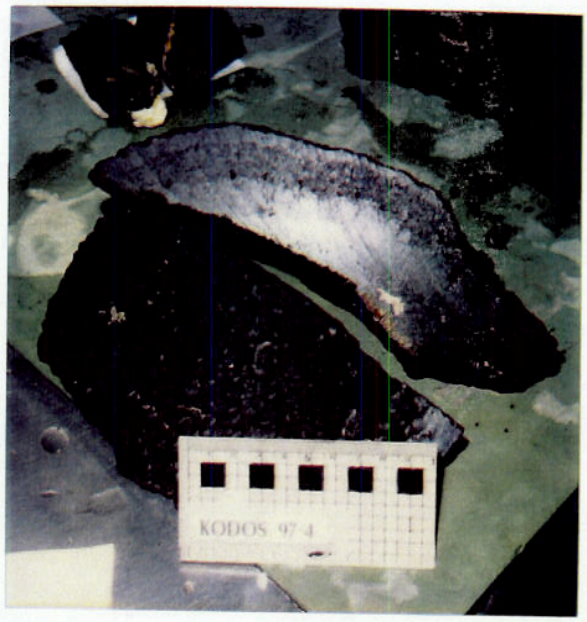
~10g of D2-4A to KORDI
(we have ~90g left)

Subsampled by: Laura B.

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 21cm x 18cm x 7cm Location: R1

Sample Id: D2-5 Weight(kg): 1.83 kg Depth(m): 1708-1650



D2-5
KODOS 97-4

Mn Crust Description

Surface Texture: botryoidal, smooth over older crust is exposed (bottom areas where)

Mn Crust Thickness(mm):

Min: 40 Max: 65 Ave: 50

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	0	10	7	massive black
2	15	20	15	porous rei. black
3	25	35	30	massive black
4				
5				
6				

Comments and XRD Mineralogy:

3 distinct layers

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
—			
	50% 4ORD1		
	50% US6-5		

Substrate Description

RockType: Breccia

Description: altered clast w/ phosphorite in vugs in lower part of crust
Thin Mn-oxide between CFA + substrate

ology: encrusting forams on surface

Described by: Leanne Roberts

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 27 cm x 14cm x 7.5cm Location: R1

Sample Id: D2-6 Weight(kg): 2.2kg Depth(m): 1725-1650

Mn Crust Description

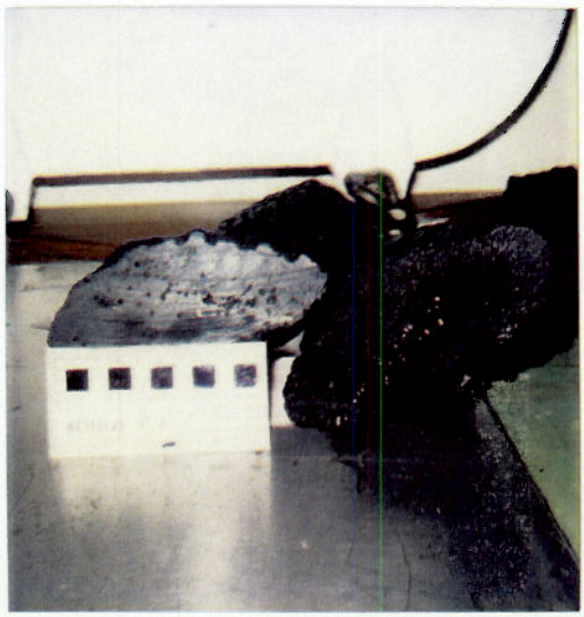
Surface Texture: Botryoidal
large on top smaller on bottom

Mn Crust Thickness(mm):

Min: 55 Max: 85 Ave: 75

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	0	5	3	massive black
2	15	20	17	porous black
3	40	55	50	massive black, top 1/2 has CFA filled vugs
4				
5				
6				



D2-6
KODOS 97-4

Comments and XRD Mineralogy:

Substrate completely broken off

Analyses

Subsample No.	Analysis	Layer	Thick.	Wt.(g)
D2-6A	CC	Bulk	0-75	~70g
D2-6B	CC	layer 1	0-10 mm	~60g
D2-6C	CC	layer 2	10-18	~35g
D2-6D	CC	layer 3	18-75	~25g

60% USGS
40% KORDI

~10g of D2-6A to KORDI
(we have ~60g left)

Substrate Description

RockType: none

Description: —

ology: encrusting forams on surface

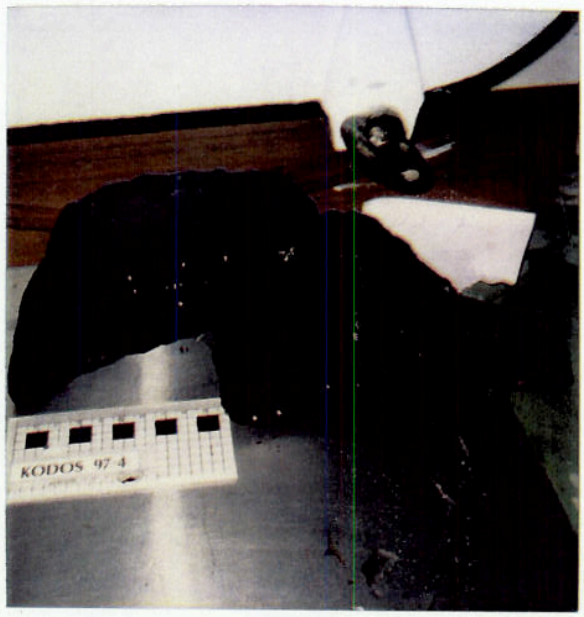
Described by: Leanne Roberts

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 **Size(cm):** 25cm x 16cm x 7cm **Location:** R1

Sample Id: D2-7 **Weight(kg):** 2.3kg **Depth(m):** 1725-1650



D2-7
KODOS 97-4

Mn Crust Description

Surface Texture: modified Botryoidal, relatively large vugs caused perhaps by current erosion

Mn Crust Thickness(mm):

Min: _____ Max: _____ Ave: 90

on area w/ substrate exposed

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1			5	massive black
2			20	porous black
3			65	massive black w/
4				CFA filled vugs
5				close to top.
6				

Comments and XRD Mineralogy:

3 distinct layers

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
	50% KORDI		
	50% USGS		

Substrate Description

RockType: very small area, perhaps clast from a Breccia, highly altered

Description: very little substrate rock

Biology: encrusting forams on surface

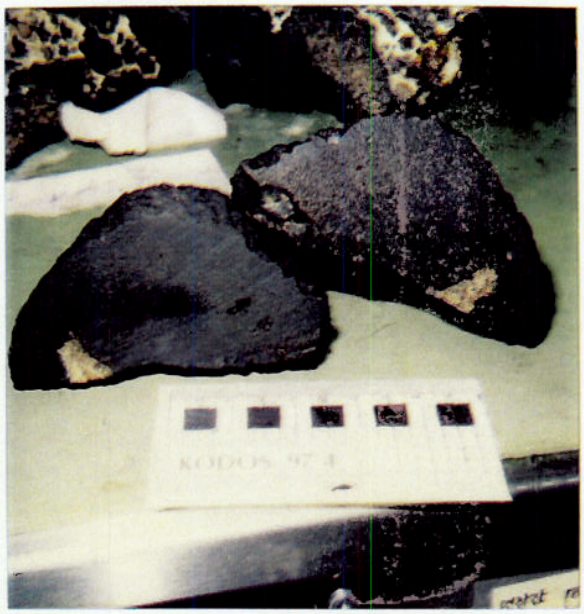
Described by: Leanne Roberts

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 **Size(cm):** 19½ x 9½ x 5½ **Location:** R1

Sample Id: D2-8 **Weight(kg):** 0.83kg **Depth(m):** 1725-1650



D2-8
KODOS 97-4

Mn Crust Description

Surface Texture: botryoidal
larger on top, smaller on side

Mn Crust Thickness(mm):

Min: 55 Max: 65 Ave: 57

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	5	10	6	massive black
2	15	20	18	porous black
3	35	40	37	massive black
4				
5				
6				

Comments and XRD Mineralogy:

3 distinct layers

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
—			
	50% HORD1		
	50% USGS		

Substrate Description

RockType: Hyaloclastite

Description: clast highly altered

ology: encrusting forams on surface

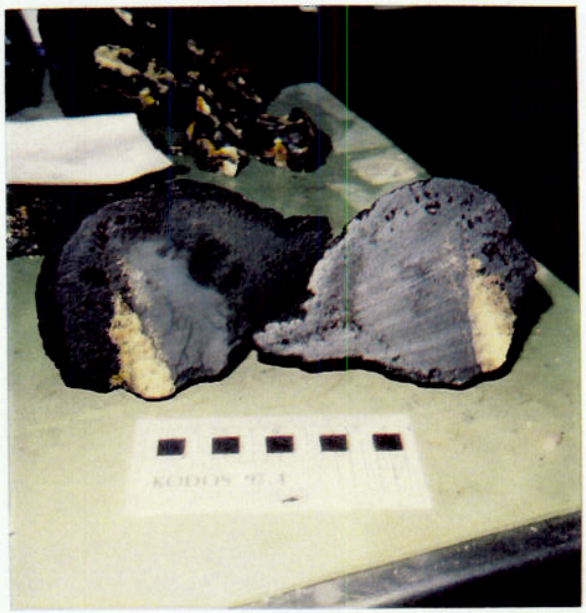
Described by: Leanne Roberts

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 **Size(cm):** 11cm x 11cm x 6½cm **Location:** R1

Sample Id: D2-9 **Weight(kg):** 0.78kg **Depth(m):** 1725-1680



Mn Crust Description

Surface Texture: granular → botryoidal

Mn Crust Thickness(mm):

Min: 55 Max: 65 Ave: 60

Outer to Inner Layers(mm)

upper surface crust

	Min	Max	Ave	Texture & Color
1	0	5	5	massive black
2	10	15	12	red/black porous
3	40	45	44	massive black
4				with small amount of phosphorite at base.
5				
6	15	26	20	Porous black - Underside crust

Comments and XRD Mineralogy:

layers form a 90° angle at top of sample, perhaps due to shape of substrate on broken off area

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
—			

50% HORDI
50% USGS

Substrate Description

RockType: Altered hyaloclastite

Description: Clast is surrounded by thin Mn-oxide layer on bottom + Thick crust on Top

ology: few encrusting forams

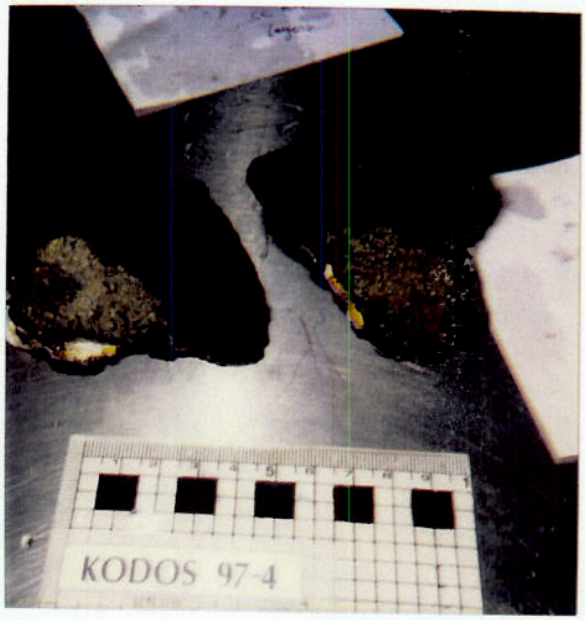
Described by: Leanne Roberts

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 **Size(cm):** 10cm x 6cm x 7cm **Location:** R1

ımple Id: D2-10 **Weight(kg):** 0.33kg **Depth(m):** 1725-1650



D2-10
KODOS 97-4

Mn Crust Description

Surface Texture: granular → botryoidal

Mn Crust Thickness(mm):

Min: 20 Max: 35 Ave: 25

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	5	7.5	5	porous black
2	15	25	20	massive black
3				few vugs
4				
5				
6				

Comments and XRD Mineralogy:

2 layers fairly indistinct

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
—			
50% HORDI			
50% USGS			

Substrate Description

RockType: Single clast from a breccia

Description: clast highly altered
clast surrounded by phosphorite

ology: NONE

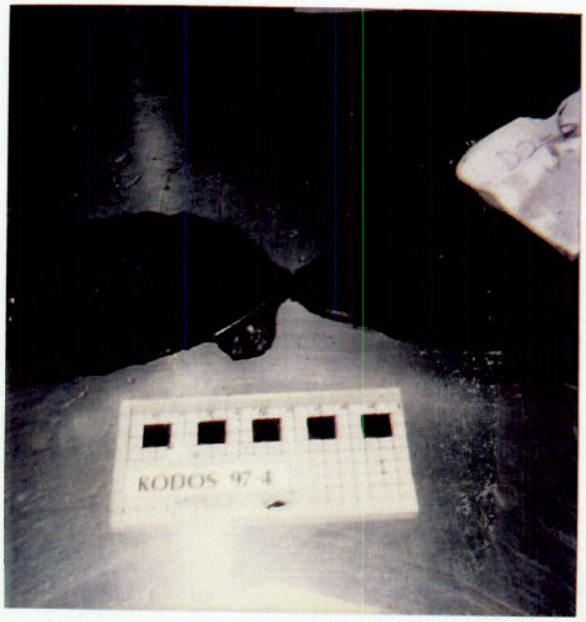
Described by: Leanne Roberts

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 **Size(cm):** 15x4 x 10 **Location:** R1

Sample Id: D2-11 **Weight(kg):** 0.55 **Depth(m):** 1725-1650



D2-11
KODOS 97-4

Mn Crust Description

Surface Texture: botryoidal

Mn Crust Thickness(mm):

Min: 40 Max: 40 Ave: 40

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	0	10	8	massive black
2	10	15	14	porous black } have few
3	15	20	16	massive black / vugs
4				
5				
6				

Comments and XRD Mineralogy:

No substrate

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
50% HORDI			
50% USGS			

Substrate Description

RockType: none

Description: 3 indistinct layers

ology: Encrusting forams

Described by:

Susie Zielinski

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 Size(cm): 14cm x 12cm x 3½cm Location: R1

Sample Id: D2-12 Weight(kg): ½ kg Depth(m): 1725-1650

Mn Crust Description

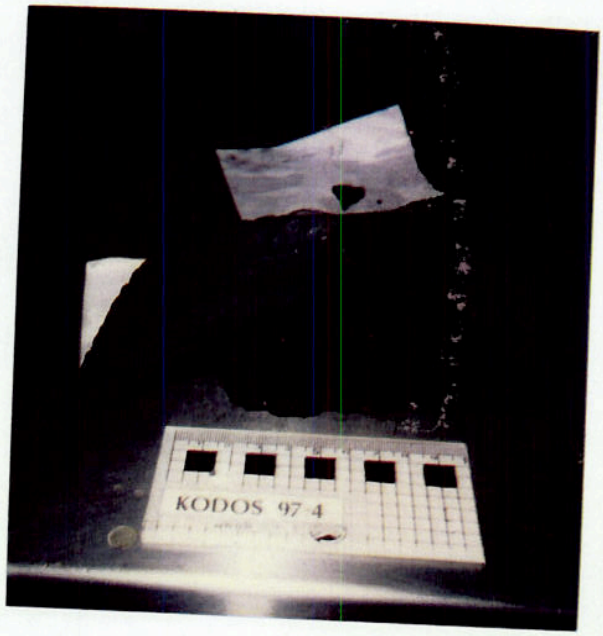
Surface Texture: Botryoidal

Mn Crust Thickness(mm):

Min: _____ Max: _____ Ave: 35

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1	5	10	7	black massive
2	10	15	12	black porous
3			15	black massive
4				
5				
6				



D2-12
KODOS 97-4

Comments and XRD Mineralogy:

Substrate rock broken off

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
50%	KORDT		
50%	USGS		

Substrate Description

RockType: NONE

Description: —

Biology: Encrusting Forams

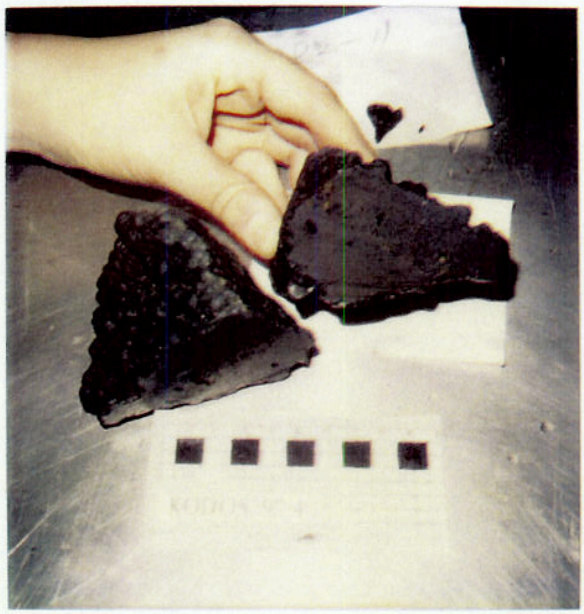
Described by: Leanne Roberts

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 **Size(cm):** 10 x 12 x ? **Location:** R I

Sample Id: D2-13 **Weight(kg):** 0.4kg **Depth(m):** 1725-1650



D2-13 KODOS 97-4

Mn Crust Description

Surface Texture: Botryoidal - Modified - relatively large

Mn Crust Thickness(mm):

Min: _____ Max: _____ Ave: 50

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1			10	black massive
2			20	red-black porous
3			20	black massive
4				
5				
6				

Comments and XRD Mineralogy:

Substrate rock is missing

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)
—			

50% FORDI
50% USGS

Substrate Description

RockType: None

Description: —

ology: Encrusting Foram

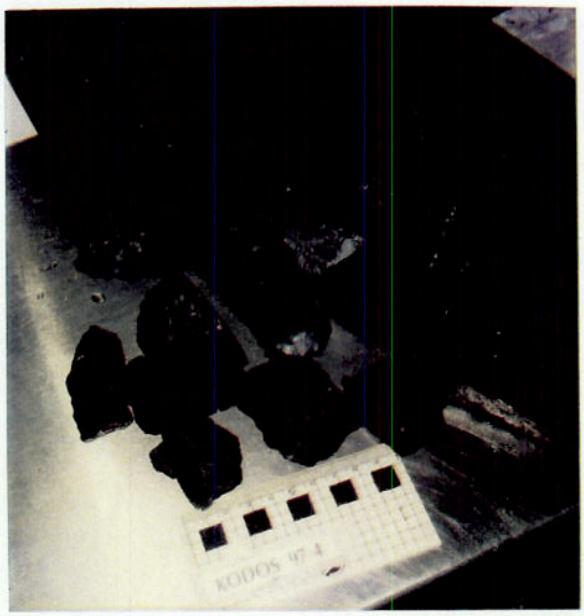
Described by: Roberts

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 **Size(cm):** 5x2.5x3 to 7x10x2 **Location:** R1

Sample Id: D2-14 **Weight(kg):** 1.0 Kg **Depth(m):** 1735-1650



D2-14
KODOS 97-4

Mn Crust Description

Surface Texture: botryoidal

Mn Crust Thickness(mm):

Min: 1.5 cm Max: 3.0 cm Ave: 2.7 cm

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1				
2				
3				
4				
5				
6				

Comments and XRD Mineralogy:

Analyses

Subsample No. Analysis Layer Thick. Wt.(g)

all To HOEDT

Substrate Description

RockType: none

Description: 10 various pieces some show layers (3), but not very distinct

.ology:

Described by: Susie Zielinski

Subsampled by:

SAMPLE DESCRIPTION

Cruse Id: KODOS97-4 **Size(cm):** 2x2x2 to 11x7x3 **Location:** R1

Sample Id: D2-15 **Weight(kg):** 600g **Depth(m):** 1725-1650

Mn Crust Description

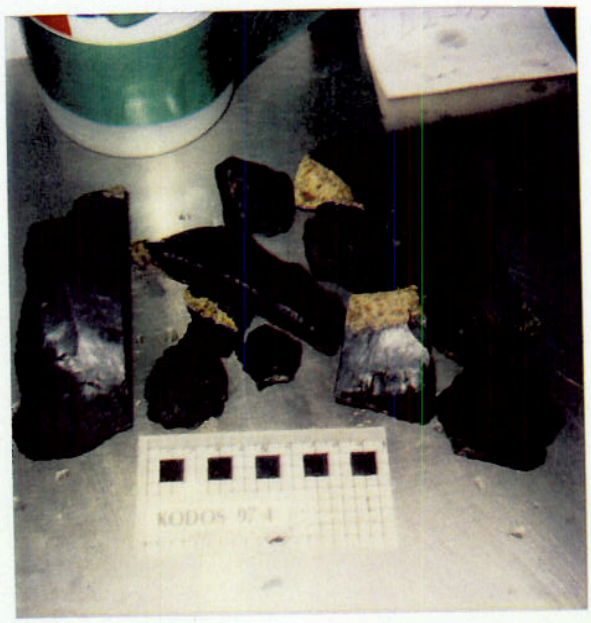
Surface Texture: non crust surface exposed only fragments of older crust layers

Mn Crust Thickness(mm):

Min: 1.5cm Max: 2.5cm Ave: 2.0cm

Outer to Inner Layers(mm)

	Min	Max	Ave	Texture & Color
1				
2				
3				
4				
5				
6				



D2-15 KODOS974

Comments and XRD Mineralogy:

Fragments of mostly massive, dense inner layers

Analyses

Subsample No.	Analysis	Layer Thick.	Wt.(g)

all to HOKDI

Substrate Description

RockType: Altered breccia - reddish brown clasts, yellow matrix (phosphorite)

Description: inner portions of crusts - no surfaces exposed

ology:

Described by: Susie Zielinski

Subsampled by:

DREDGE OPERATIONS LOG

			JD	LOCAL
CRUISE	KODOS97-4	DATE	236	8 25 97
STATION	1	CHIEF SCIENTIST	MOON/LEE/HEIN	
DREDGE NO.	D2	TECH ON WATCH	HEIN	
DEPTH INTERVAL(m) on to off bottom	1692 – 1732			

	ON STATION	DREDGE ON BOTTOM	DREDGE OFF BOTTOM	OFF STATION
gmt	2034	2102	2223	2250
lat	09° 26.25 W	09° 24.6 N	9° 24.95'	09° 23.41'
lon	166° 02.9 E	166° 03.1 E	166°03.69'	166° 03.34'
z	1853 m	1692 m	1732	1645

Site Description and Target: Redo of dredge D1 since we missed the summit. Rugged summit of R1, upper steep slope. Objective - to dredge → 2000 m - 1500 m recon survey.

Operation*	GMT	Depth(m)	Wire Out(m)	Tension	HDG/SPD	Comments
on station	2034	1853	ϕ		078°/1.6	bag in H_2O
on bottom	2102	1726				letting slack to ~ 2070 m out
	2109	1660	2100		083°/1.2	2100 wire out
begin dredge						letting wire out slowly
	2121	1672	2200		094°/1.1	09° 24.45/166° 03.22'
small bites	2133	1594	2195	1.5	102/1.8	a bunch of small 1.5's
good bite!	2135	1606	2199	1.7	096/1.8	09° 24.32/166° 03.38
"	2136	1632		1.7	103/1.7	
"	2137	1634		1.8 x2		
"	"			1.9	108/1.8	09° 24.3 /166°
	2138	1649		2.1, 2.2	103/1.5	sudden tension drop!
	"			2.1, 2.0		
	2139	1675		2.3, 2.4	099/1.7	sudden tension drop

*on/off bottom, bites, etc.

Other Comments:

many good bites. expect a good haul.

DREDGE OPERATIONS LOG

			JD	LOCAL
CRUISE	KODOS97-4	DATE	236	8 25 97
STATION	1	CHIEF SCIENTIST	MOON/LEE/HEIN	
DREDGE NO.	D2	TECH ON WATCH	HEIN	
DEPTH INTERVAL(m)				

ON STATION	DREDGE ON BOTTOM	DREDGE OFF BOTTOM	OFF STATION
See page 1			

Site Description and Target: See page 1

Operation*	GMT	Depth(m)	Wire Out(m)	Tension	HDG/SPD	Comments
good bites	2140	1637		2.0, 2.1, 2.3	090/1.3	09° 24.23'/166° 03.41'
"				2.7, 3.1		
"	2141	1634	2182	3.3, 3.5	095/1.2	broke off!
	2145	1682	2160		075/1.5	
small bite	2146	1683		2.2, 2.0	075/1.2	09° 24.18/166° 03.48
"		"		2.3, 2.5, 2.7		broke off at 2.7
many small		1771		2.0-2.9	083/1.7	
bites		"		3, 3.1, 3.7	083/1.7	
"		"	2146	4.1		Hung up
more big bites	2149	1737	2136	4.8	083/1.7	broke off 9°24.2'/166°03.50'
big bite	2155	1777	2078	2.0, 2.6, 2.8, 3.2		off
big bite	2154	1748	2065	2, 2.2, 3.5, 3.7	108/1.8	09° 24.1/166° 03.5'
↓	"	"	"	3.9, 4.0, 4.2	"	broke off
small bite	2158	1745	2038	small to 3.3 then broke off	099/1.5	9° 24.03/166° 03.54'

*on/off bottom, bites, etc.

Other Comments:

DREDGE OPERATIONS LOG

			JD	LOCAL
CRUISE	KODOS97-4	DATE	236	8 25 97
STATION	1	CHIEF SCIENTIST	MOON / LEE / HEIN	
DREDGE NO.	D2	TECH ON WATCH	HEIN	
DEPTH INTERVAL(m)				

ON STATION	DREDGE ON BOTTOM	DREDGE OFF BOTTOM	OFF STATION
	See	page 1	

Site Description and Target:

see page 1

Operation*	GMT	Depth(m)	Wire Out(m)	Tension	HDG/SPD	Comments
	2201	1745	2000		080°/1.4	trying to find up hill
bringing dredge in	2210	1707	1940		092°/1.8	~~will bring dredge in soon~~
"	2214	1625	1855		086°/1.0	
	2222	1685	1724		052°/1.1	still bringing in dredge
off bottom	2223	1732	1694		"	09° 28.95' / 166° 03.69'
off station	2250		0			09° 23.41' / 166° 03.34'

*on/off bottom, bites, etc.

Other Comments: