S. Central
Johnston Is

SUBSTRATE STUDY

AMPLE ID	Mn CHEM	Pt & Au	REE	Si Chem	P.Sect.	35mm Pho	Archive	Paleo					
CD26-1						✓							
26-2				✓									
26-3													
26-4	Bulk inner 5 mm			✓		✓							
26-5	Bulk inner 5 mm			✓									
26-6													
26-7	Bulk			✓	✓	✓	✓						
26-8													
26-1-1													
26-9-2	Bulk inner 5 mm								CC substrate				
26-10									standard T.S.				

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 28 CD26-1 Location: So. Central Johnston Island

Size: 25x19x12cm Weight: ~12 kg

Mn crust thickness:

Total: min: 32 max: 50mm ave: 35mm

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: Smooth

Internal structure:

layered:
laminated:
massive: ✓
porous: ✓ in places
dendritic:
other:

CD 26-1

Mineralogy (XRD):

ssociated alteration, phosphorite, or hydrothermal deposits:

Fe oxide-staining on sides of crust & substrate

Substratum:

Rock type: Basalt

Description: Relatively unaltered gray irregular shaped & angular basalt cast w/ elongated vesicles many of which are filled w/ clear silica crystals

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 28 CD26-3 Location: So. Central [illegible]

Size: 23X13X9cm Weight: 2.8kg

Mn crust thickness:

Total: min: 24 max: 33mm ave: 8.5mm

Inner crust: min: ____ max: ____ ave: ____

Outer crust: min: ____ max: ____ ave: ____

Surface texture: Smooth

Internal structure:

layered:
laminated:
massive: ✓
porous: ✓ in places w/ some tan mud in the pores
dendritic:
other:

F7-86-HW
CD26-3
photo 1

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

A few forams on the pfg

Substratum:

Rock type: Volc. Breccia ?
[illegible] basalt clast

Description: One (?) basalt clast in varying stages of alteration [illegible] phosphate
Grey green white & tan, sugary textured & vesicular

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 28 CD26-2 Location: So-Central Johnston Is.

Size: 14.5x13.5x12cm Weight: ≈ 3 kg

Mn crust thickness:

Total: min: 2 max: 5 ave: 4mm

Inner crust: min: — max: — ave: —

Outer crust: min: — max: — ave: —

Surface texture: Irregular knobby to porous

Internal structure:

layered:
laminated:
massive: ✓
porous:
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Numerous forams on the surface

Substratum:

Rock type: Phosphatized Volc. Breccia

Description: Relatively unaltered large (6x7cm) gray, vesicular sugary textured basalt clast surrounded on 3 sides by a volc. breccia in a [illegible] matrix. The basalt clasts are sub-tangular to sub-rounded poorly sorted (<1-25mm) & somewhat closely packed. Core gray to green in color, Matrix also includes Mn

Mineralogy (XRD):

CD26-2

Analyses and subsamples:

analysis:	analyst:
CD26-2A CC 0-4mm	10.6gms
Bulk crust across top of slab.	
CD26-2B OC	58gms
Substrate avoiding large Clast	

Sample slabbed at [illegible] above photo O.C. taken from area of substrate to the right of large clast. Mn Chem taken from top of slab. Crust has small botryoids on upper surface and irregular lower surface. encrusting critters hide in hollows and substrate scraped off bottom. Difficult to get in clean grains

CD 26-3
F7-86-Hw
photo 2

SAMPLE DESCRIPTION

Cruise Id: F7-86-HW Size: 20x18x11cm Location: South Central Johnston Island

Sample Id: CD26-4 Weight: 4kg Depth:

Mn Crust Description

Surface Texture: Smooth to botryoidal

Sort of bulbous botryoids - with large porous interareas

Mn Crust Thickness:

Min: 20mm Max: 36mm Ave: 25mm

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				

CD26-4

Phos Study

Comments and XRD Mineralogy:

Crust is massive, in lower portion are pores with some clasts in them

Substrate Description

Rock Type: Phosphatized Volcanic Breccia

Description:

Gray angular to subangular aphanitic, vesicular basalt clasts floating in an ivory colored phosphate matrix. Several clasts are reworked crusts, the larger one may even have some attached substrate.

Phosphorite [illegible] in agatolike layers around some clasts and between [illegible]

ANALYSES

Subsample & Type	Analysis		
CD26-4A Bulk Crust	CC		
CD26-4B Bulk Sample	CC	23mm	22gm
From large crust clast - (70max x 22mm x?) this clast is laminated w/ Fe Stain			
CD26-4C Substrate	CC		44gm
CD26-4D Lower 5 mm	CC		6gm
3.5mm slide		G Smith	

Described By:

Subsampled By: [illegible]

CD26-4

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 28 CD26-5 Location: [illegible]

Size: [illegible] Weight: 1.9 kg

Mn crust thickness: (cm)

Total: min: 3.5 max: 4.0 ave: 3.9

Inner crust: min: 0.5 max: 1.1 ave: 0.8

middle: 1.4 1.9 1.7

Outer crust: min: 1.3 max: 1.4 ave: 1.4

Surface texture: Smooth

Internal structure:

layered: 3 (outer + middle grade into each other)
laminated:
massive: ✓ inner outer
porous: ✓ middle w/mud in pores
dendritic:
other:

Mineralogy (XRD):

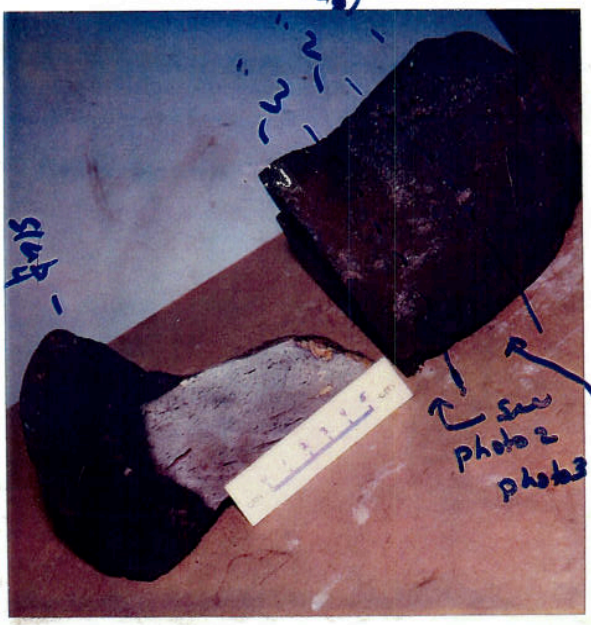
Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Basalt

Description: Gray vesicular trachytic texture. Note crust caps side of slow not top. Phosphorite in some vesicles

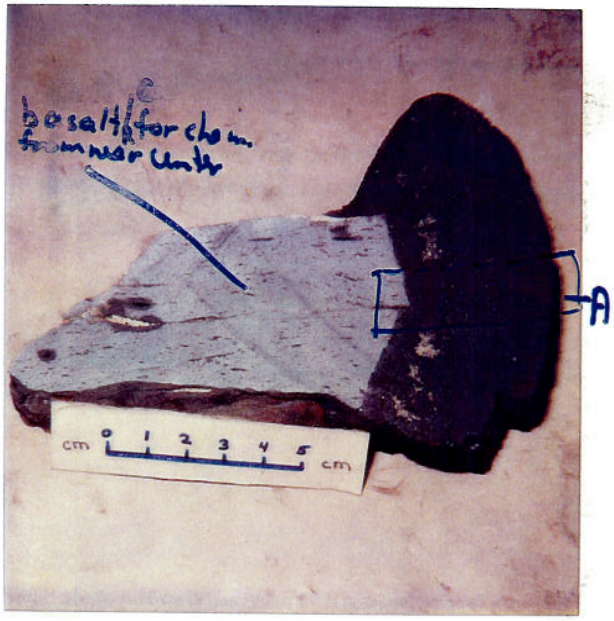
Mineralogy (XRD):



CD26-5
F7-86-HW
photo 1

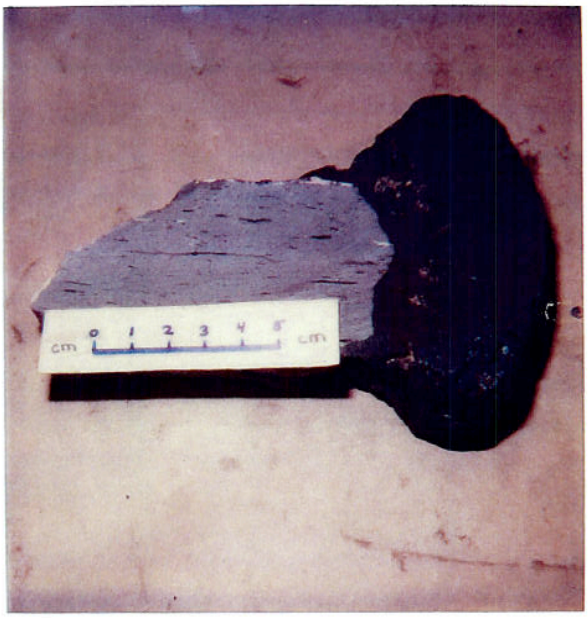
Analyses and subsamples:

subsample type ~~analysis~~:	Analysis	weight ~~analyst~~:
CD26-5A	XRD	bulk 0-37mm (36-18mm)
	CC	(20.0g)
CD26-5B	XRD	lwr 5 mm
	CC	(12.4g)
CD26-5C	OC	basalt (29.6g) phos. and vesicles



CD26-5
F7-86-HW
photo 2

This slab taken from
bigger piece (see photo 1)
SLAB 3



CD26-5
F7-86-HW
photo3

slab 2
lower 5mm of crest for
CC from this slab

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 28 · CD26-6 Location: So. Central [illegible]

Size: 21x10x8cm Weight: 1.7 kg

Mn crust thickness:

Total: min: 2.0 max: 3.5 ave: 3.0

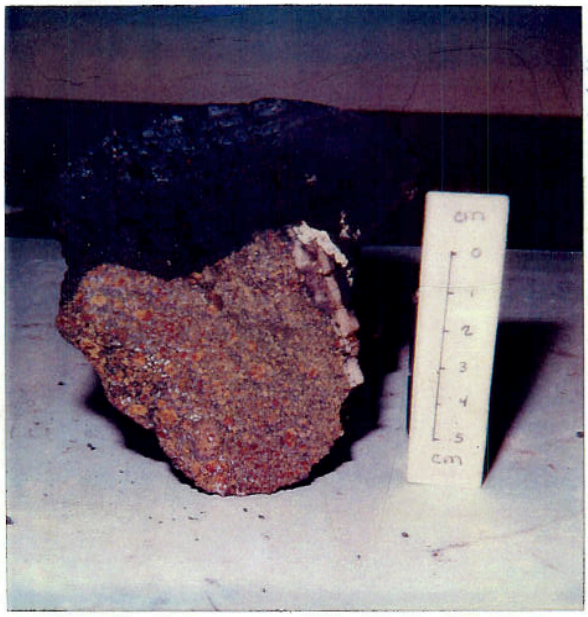
Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: [illegible]
Shiny [illegible]

Internal structure:

layered:
laminated:
massive: On one side (right side in photo)
porous: on left side in photo
dendritic:
other:



CD26-6

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:
orange Fe. oxide thruout porous parts Fresh mud in large pores

Substratum:

Rock type: Volc. Breccia

Description: [illegible]

Mineralogy (XRD):

Analyses and subsamples:

analysis:	analyst:

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: [illegible] CD-26-7 Location: [illegible]

Size: [illegible] Weight: [illegible]

Mn crust thickness:

Total: min: 3 max: 5 ave: 4 cms

Inner crust: min: – max: – ave: –

Outer crust: min: ____ max: ____ ave: ____

Surface texture: [illegible]

Internal structure:

layered: [illegible]
laminated:
massive:
porous:
dendritic:
other:

Mineralogy (XRD):

Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: [illegible]

Description: [illegible]

layer of metallic (hydrothermal) Mn in top of substrate, the lightest gray area was soft material.

apatite cement

Mineralogy (XRD):

CD26-7-1

Analyses and subsamples:

analysis:	analyst:
CD26-7A Bulk Crust	CC 32mm 30gm
CD26-7B Substrate	OC 24gm
CD26-7C Gray Layer some substrate included	CC 3-5mm thick 11gm
Archived Slab CD26-7-2	
Polished Section (location indicated on back)	

CD26-7-1

Archived

CD26-7-2

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 28 CD 26-8 Location: [illegible]

Size: 20x15x11 cm Weight: 1.0 kg

Mn crust thickness:

Total: min: 1 mm max: 25 mm ave: 10 mm

Inner crust: min: max: ave:

Outer crust: min: max: ave:

Surface texture: Medium [illegible] abraded

Internal structure:

layered:
laminated:
massive: Mainly massive
porous: Porous in [illegible]
dendritic:
other:

Mineralogy (XRD):

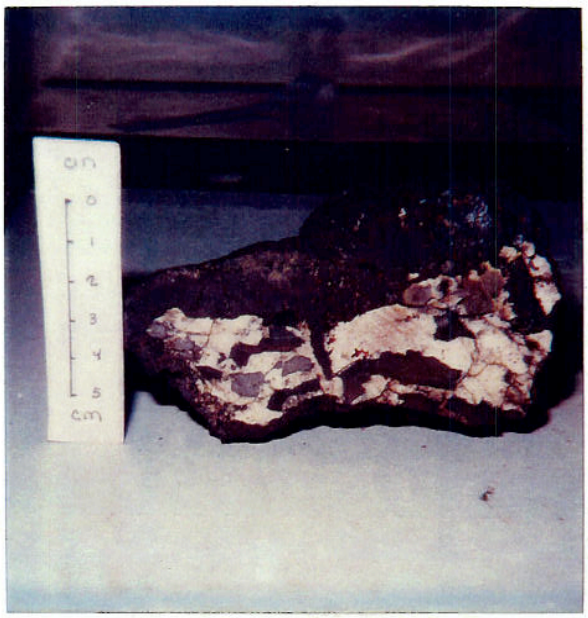
Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Phosphatized Pelagic Cobblestone

Description: Common angular [illegible] (1x3 to 0.5x1.0 cm) Mn crust fragments and occasional angular basalt fragments (0.5 cm²) [illegible] in phosphatized [illegible] ooze. Mn crust fragments are [illegible]

Mineralogy (XRD):



CD26-8

Analyses and subsamples:

analysis:	analyst:

SAMPLE DESCRIPTION

Cruise Id: F7-86-HW Size: 14 x 9 x 9 cm Location: S. Central Johnston I.

Sample Id: CD26-9-1 Weight: 1.0 kg Depth: _____

Mn Crust Description

Surface Texture: mostly smooth and smoothed botryoidal. Some microbotryoidal in "grooves"

Mn Crust Thickness: (cm) (all sides)

Min: 0.2 Max: 1.6 Ave: 0.8

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				

CD26-9-1
F7-86-HW

Comments and XRD Mineralogy:

Crust is mostly porous, massive in places. Orange Fe-oxide staining in crust. Some larger pores have fresh mud in them. Crust separated from substrate by thin (~1 mm) layer of phosphorite.

Substrate Description

Rock Type: Basalt clasts and mn.

Description:

Fractured basalt clasts and massive mn. Phosphate cements the 2 basalt clasts. Clasts have nice amphibole phenocrysts. Orange Fe-oxide & phosphorite lines fractures & laminations in massive mn. A few smaller basalt clasts (a few mm diam) cemented in bigger clasts by phosphorite.

ANALYSES

Subsample & Type	Analysis	Weight

Described By:

Subsampled By:

CD26-9-1
F7-86-HW

SAMPLE DESCRIPTION

Cruise Id: F7-86-HW Size: 13x9x6 cm Location: S. Central Johnston Is.

Sample Id: CD26-9-2 Weight: 0.8 kg Depth: _____

Mn Crust Description

Surface Texture: smoothed botryoidal

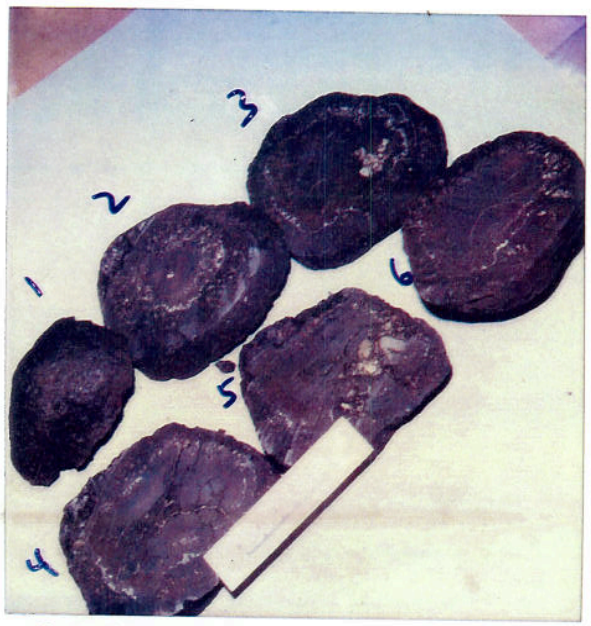
Some microbotryoidal on one side. Can't tell which is top. Probably has been rolled around a lot.

Mn Crust Thickness: (measured on all sides since no "top")

Min: 0.5 Max: 1.6 Ave: 1.0

Layers (Outer to Inner):

	Min	Max	Ave	Texture
1.				
2.				
3.				
4.				
5.				
6.				



CD26-9-2
F7-86-HW

Comments and XRD Mineralogy:

Many textures massive in places porous in places. Some larger pores contain fresh mud. Orange Fe-oxide staining throughout entire rock. White layer (<1 mm) of phosphorite separates layer from substrate, which in this case is a mn nucleus w/ a few basalt clasts in it.

Substrate Description

Rock Type: Mn nucleus w/ a few basalt clasts.

Description:

Mn nucleus more massive than "crust". One basalt pebble, fairly fresh gray vesicular. A couple altered green basalt pebble + coarse sand w/ phosphate + Mn cement

ANALYSES

Subsample & Type	Analysis	Weight
CD26-9-2A	XRD	bulk crust 0-10 mm (S.
	CC	(11.09)
CD26-9-2B	XRD	inner 5 mm of crust
	CC	(6.18)
CD26-9-2C	XRD	"substrate" which is Mn nucle
	CC	(12.69)

NOTE: A and B sampled from all sides
A and C from slab 2
B from slab 3 and 4

Described By: Subsampled By:

CD26-9-2
F7-86-HW

Sample Description

Cruise I.D: F7-86-HW Sample I.D: Sta: 28 CD 26-11 Location: [illegible]

Size: 14x8x7 cm Weight: 0.6 kg

Mn crust thickness: patchy patina 4 mm thick

Total: min: ____ max: ____ ave: ____

Inner crust: min: ____ max: ____ ave: ____

Outer crust: min: ____ max: ____ ave: ____

Surface texture: granular

Internal structure:

layered:
laminated:
massive:
porous:
dendritic:
other:

Mineralogy (XRD):

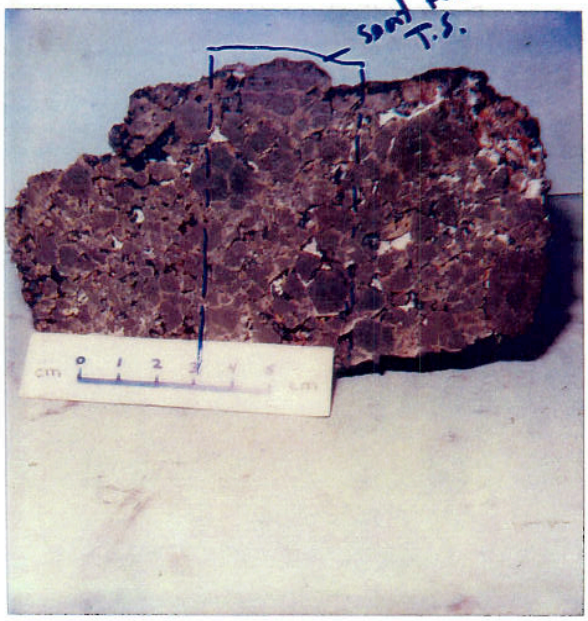
Associated alteration, phosphorite, or hydrothermal deposits:

Substratum:

Rock type: Volcanic Breccia

Description: Angular green-brown aphyric basalt clasts (1mm - 2cm diam) with small 1/2 mm vesicles with patchy [illegible] to orange phosphate cement. Interstices between clast are 1mm - 1.5cm in diam. Common Mn between interstices

Mineralogy (XRD):



CD26-10
F7-86-HW

requested back of this face be thin sectioned as shows more mn patina.

Analyses and subsamples:

analysis:	analyst:
1/2 of sample given to Bureau of Mines	

CD26-10 T.S. sample
F7-86-14W