DATE: 15 August 1984 SAMPLE:
CRUISE ID: SO 33 48 DK box dredge
LOC: VI
AREA: D (N of SP Lee Seamount)

	time (GMT)	LAT (N)	LON (W)	water depth (m)	wire o
ON BOTTOM =	2008	9° 14.80	164° 50.72		170
OFF BOTTOM =	2146				139

time 1 hr 38 min

RECOVERY WEIGHT = Total 235 kg

crust
30 kg
200 kg basalt
5 kg Sediment

CRUST THICKNESS = 0.4 to 5 cm Avg = 1 cm
2 generations

SUBSTRATE = basalt; conglomerate w/ white phosphate cement, basalt clasts and minor calcite
Many rounded cobbles as from talus pile

COMMENTS:
Good Crusts!

* 1 microbio sample
* Smear slides made

10 Dr

1	2
Rock Type: Olivine basalt, massive flow	→ -do-, perhaps trap rock
Color: Light olive gray (5Y 5/2) to medium gray (N5)	→ -do-
Texture: microphyric, intergranular	→ -do-
Phenocrysts Olivine ± 15%, ± 0.5 mm; Augite(?) ± 0.25 mm, ± 1%; Plagioclase(?) ± [illegible], ± 2%	— -do-
Groundmass: Plagioclase, Olivine, Clinopyroxene, Opaques } not determined	→ -do-
Vesicles: % : Varies greatly over short distance (± 10% avge) (some areas are scoriaceous); Size: extremely variable (± 0.10 mm – ± 5 mm) (± 0.35 mm avge); Shape: very irregular (vuggy to spongy); Filling: calcite & zeolites (linings	≠ dense
Alteration: extensive: (smectitization, oxidation of olivine crystals, zeolitization of feldspars(?), carbonation)	→ -do-
Remarks: pebble to large cobble-size rounded to angular clasts set in volcanogenic breccia and also free, unconsolidated. Appears to be highly altered, phenocrysts are often skeletonized, with only a lacework of smectite or calcite remaining or massive hematite powder; zeolites apparent in the groundmass and lining vesicles; appear to have been flow basalt. fractures lined with tobermorite(?) and $Fe(OH)_3$ & stains; serves as substrate for encrustation of Mn-Oxide (± 5 mm thick) on free pieces	→ -do- ≠

appear, from degree of roundness, to have been subjected to considerable transport by water (wave action?) prior to final deposition and cementation.

because of density and evenness of distribution of components, must be thought of as having been a dike or trap rock

Sample No: 30 33 10 DK 3 | 30 33 48 DK 4

Rock Type: Olivine Basalt, (Trap?) → do, amygdaloidal (flow?)

C r: Brownish-gray (5YR 3/1) → - do -

Texture: Phyric, intergranular → - do -

Phenocrysts: Olivine ± 20%, ± 0.75 mm dia
Augite(?) ± 3%, ± 0.50 mm dia
Plagioclase(?) ± 2%, ± 0.50 mm dia
→ - do -

Groundmass: Plagioclase?
Clinopyroxene?
Olivine?
Opaques?
(not determined) → - do -, + glass (?)

Vesicles: %: absent (dense) ≠

Size: <1 mm – ±5 mm dia (±2 mm large), ±10%

Shape: round to oval, coalescing

filling: Smectite (greenish-yellow), (±90% of vesicles are filled)

Alteration: extensive-intense (oxidation, iddingsitization & smectitization of olivine; hydration → - do; smectitization, of glass; zeolitization

Remarks: Subround to subangular pebble to cobble-size clasts both free (loose) and cemented in volcanogenic conglomerate; most pieces are cut by veinlets filled with smectites, zeolites, and these perhaps serve as conduits for late-stage alterations; most pieces show advanced reworking by water-currents (wave-action?) prior to final deposition and cementation; free pieces (and some cemented pieces) serve as substrate for encrustation (±1 mm thick) by ferromanganese oxide-hydroxide → ! - do -

→ - do -, but very thick (±40 mm) deposits found on this substrate

Note: samples 48 DK 1a, b & 2 a, b are very similar except vesicle content and kind and degree of alteration – may all be from the same magma batch, but probably represent different flow units

	5	6
Rock Type:	Volcanogenic breccia	→ -do-
Color:	Moderate Brown (5YR 4/4)	→ Grayish-Brown to Moderate brown (5YR 3/2) (5YR 4/4)
Texture:	Clastic	→ -do-
Matrix:	Olivine basalt rock fragments ±15% " " glass fragments, ±15% " " ash, ±60%	→ ±60%
Cement:	calcite, ±10%	→ open space between grains cement ±15% → -do-, but probably ±25% calcite
Average grain size:	extremely variable (±2mm average)	±3mm, average
range:	(silt size — large pebble-size)	(fine to coarse gravel size)
grain shape:	angular	angular
Sorting:	very poorly sorted	moderately sorted
Porosity:	±80%	±20%
Permeability:	±80%	±20%
Alteration:	extensive — complete(?) (oxidation, hydration, smectitization, zeolitization, carbonation,	→ -do- → -do-
Remarks:	Cobble-to-boulder-size clasts dislodged from outcrop by dredge(?); rock gives appearance of various grade size components having been mixed, but not to homogeneity, before final deposition and lithification; angularity of the components suggests rapid deposition from high-energy environment with no further disturbance; highly altered (particularly oxidation) condition of rocks and cementation with calcite and zeolites suggests infiltration by hydrothermal fluids; serves as substrate for deposition of ferromanganese crust (<1mm thick)	→ -do- → -do-, but better sorting and homogeneity of composition of matrix components suggests deposition without further disturbance except for infiltration by hydrothermal fluids → -do-, but deposit is thicker (±2mm), knobby in form

	7	8
Rock Type:	Volcanogenic Breccia	→ -do-
Color:	Dark yellowish-brown (10YR 4/2)	White (N 9) to Dark gray (N 3) (cement) (predominant color of matrix rock)
Texture:	clastic	→ -do-
Matrix:	Volcanic rock clasts	→ -do-
Cement:	phosphorite	calcareous ooze
Average grain size:	extremely variable (±2mm avg) range. (fine silt to large pebble-size)	→ -do-
" grain shape:	subangular - subround	subrounded to angular
Sorting:	extremely poor	→ -do-
porosity:	±15%	±10%
Permeability:	±5%	±5%
Alteration:	extensive (phosphorization of original calcareous ooze cement	Superficial (phosphorization(?) resolution, redeposition of calcite in cement)

← most other alteration prior to formation of breccia →

Remarks: pebble-to-boulder-size clasts dislodged from outcrop by dredge; orig. cement was apparently calcareous ooze (→ chalk) subsequently replaced by apatite, colored by $Fe(OH)_3$(?). The cement carries a large amount of fine volcanic detritus very unevenly-distributed throughout; rounding of most matrix constituents indicates a period of reworking by water currents (wave action?) prior to final deposition and cementation. a number of different rock types are represented in the matrix material indicating concentration of detritus from a (probably) large area over an extended period of time; fresher, less-altered chalk found in certain open spaces in the rock; serves as substrate for Mn-Oxide encrustation (± 1mm thick)

→ -do-, apparently post-dates 43 DK 6, because angular pieces of its phosphorite cement are included as matrix material in this rock.

Sample No.: [illegible] same as 43DK2

Rock Type: ~~Trachyte~~, vesicular

Color: Light olive gray (5Y 5/2)

Texture: Microphyric, intergranular, subtrachytic (approaching pegmatoid)

Phenocrysts: Sanidine(?), ±5%, ±0.50mm
Amphibole, ±3%, ±0.75mm

Groundmass: Sanidine(?), amphibole, opaques } not determined

Vesicles: %: ±10%
size: ±0.50 mm
shape: irregular, angular to rounded, almost diktytaxitic
filling: zeolites(?) (lining only)
calcite(?)

Alteration: extensive(?) (zeolitization, smectitization, hydration) carbonation

Remarks: coarse gravel to pebble-size subangular clasts set in phosphorite-chalk cement, forming, along with several other igneous rock types, a volcanogenic breccia; both feldspar and amphibole euhedra found projecting into the cavities in the rock (pegmatoid texture(?)) cross-cut by fractures filled with calcite, dendritic Mn-oxide.

Interesting to see what kind of amphibole! where is it now.

2-12-85
— Cannot relocate?!
(too much Beck's Bier that night on the Sonne!?)

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Volcanogenic breccia
pale greenish-yellow (10Y 8/2)

Clastic

(Matrix): olivine basalt, tuff fragments } not determ.
" " glass fragments }

Cement: phosphorite

(Avge grain size:) ±3mm

(" grain shape:) angular

(Sorting:) moderately poorly sorted

(porosity:) ±35%

(permeability:) ±30%

(Alteration:) complete; (zeolitization, smectitization, hydration, oxidation; phosphorization of calcareous cement)

(Remark) pebble to cobble-size clasts dislodged from outcrop by dredge. Angularity of grains and sorting indicate probable primary deposition from volcanic eruption, rapid cementation, alteration subsequent to primary induration; probably ascending hydrothermal fluids have altered most events to zeolites and smectite; serves as substrate for encrustation by ferromanganese oxide (±2 cm thick, knobby, warty surface)