SO33 71DK1

Rock Type: Basalt (Pre-Alkalic?)

Color: Pale olive (10Y6/2) to brownish-gray (5YR 4/1)

Texture: Microphyric, Subarachnic

Phenocrysts: Plagioclase
Pyroxene?

Groundmass: Plagioclase
Pyroxene?
Glass?
Opaques?
(not determined)

Vesicles: 0% (varies greatly within samples) nearly dense to up to 30%.
Shape: irregular elongate
Size: ± 1mm
filling: often filled with calcite or lined with phillipsite needles

Alteration: Extensive!
(Zeolitization, hydration, smectitization, oxidation)

Remarks: pebble to boulder-size, generally rounded clasts set in cements of varying types, forming volcanogenic conglomerates; though dark in less altered pieces, apparently all alkalic basalt probably of same origin (major constituents appear to be flat thin hexagonal plates to four-sided needles of plagioclase and sunny black four-to-six-sided needles of pyroxene; Serves as substrate (as volcanogenic breccia) for ferro manganese deposit described

(related to other basalts of Arch)

SO33 71DK2

Volcanogenic Breccia I

Light brownish gray (5YR 6/1)

Clastic
(matrix): ~~Trachyte~~ basalt fragments, ± 50%.
(cement): 'sandstone' made of:
(pelecypod): shell fragments, ± 10%.
Manganese micronodules, ± 1%.
~~Trachyte~~ basalt fragments, ± 5%.
calcite?, ± 1%.
phillipsite?, ± 2%.
phosphorite?, ± 1%.
(Open space), ± 30%.
(Average grain size:) ± 1mm
(" grain shape:) subrounded
(Sorting:) extremely poorly-sorted
(porosity:) Open - textured
(permeability:) 80+%

extensive; (Zeolitization, phosphorization, recrystallization of [illegible]

pebble-to-boulder size clasts composed of volcanogenic conglomerate; the included ~~trachyte~~ clasts, generally well subrounded, are in various states of alteration - some by hydrothermal and some by subaerial weathering; roundness of the matrix constituents and surface weathering suggest a period of subaerial exposure and re-working by water currents prior to submergence. Serves as substrate for deposition of thin (up to ± 2 cm) to thick encrustations of warty ferro-manganese oxide; fractures in ~~trachyte~~ matrix material lined with [illegible] dendrites. (one generation, dendrites internally)

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Rock Type: Volcanogenic conglomerate II

Color: (matrix, usually cement) greenish-gray (5GY 6/1) / very pale orange (10YR 8/2)

Texture: clastic

Matrix: ~~Trachite~~ basalt? clasts ± 70%.

Cement: phosphorized chalk ± 30%.

Average grainsize: (extremely variable) (range: sand to large cobble-size)

Ill grain shape: subrounded

Sorting: extremely poorly sorted

porosity: ± 60%.

permeability: ± 40%.

Alteration: (cement) (extensive; phosphorization, zeolitization?)

Remarks: Similar in form to 71 DK2, cement differing; infiltration by $FeOPO_3$(?)-bearing solutions variously colors the phosphorite cement; soft, porous, but harder than 71 DK4; serves as substrate for thin (<1mm) to thick (±15 mm), compact (fine nodose supertopography) encrustation of ferromanganese oxide; more indurated dense phosphorite (pale yellowish brown (10YR 6/2) to medium brownish-gray (5YR 5/1) also present as thin bands or layers

Probably the same as 71 DK2, but coming from directly beneath ferromanganese surface hence no [illegible] coloring, greater induration

Chalk 4

very light gray (N 8) to very pale orange (10YR 8/2)

granular

foraminiferal tests — (not determined)

calcite, phosphorite (francolite?)

~~(not~~ determined)

(not determined)

moderately well-sorted(?)

80+%.

-do-

incipient; (phosphorization(?) of chalk — very spotty; recrystallization of calcite in foraminifera —

Subangular pebble-to-cobble-size clasts probably already dislodged from outcrop before collection by dredge (general encrustation with ferromanganese deposit — nobby, warty, ± mm thick); incipient phosphorization(?) of the chalk discontinuous, spotty (pale orange area) not indurated; intensely penetrated by worm(?) burrow tubes (serves as channels for manganese oxide deposition

Sample No. S033 71 DK5

Type: foraminiferal ooze

Color: Very light brownish-gray (5YR 7/1)

6

**Rock Type:** Basalt, (Pyroxene alkalic?)

**Color:** Dark gray (N3) (bluish)

**Texture:** Microphyric, subtrachytic (quite directed)

**Phenocrysts:** glomerophyric together and as single phenocrysts
- Plagioclase; ±10%, ±1mm
- Pyroxene, ±15%, ±1mm
- Amphibole(?), <5%, ±1mm

**Groundmass:**
- Plagioclase?
- Pyroxene(?)
- Amphibole(?)
- Glass?
- Opaques?

(not determined)

**Vesicles:** absent

**Alteration:** moderate, (argillation [smectite] oxidation, hydration)

**Remarks:** angular cobble-to-boulder-size clasts perhaps dislodged from a primary outcrop (no adhering cement on the clasts); displays strong flow structure, directed texture; is the freshest rock recovered in the dredge, but displays aureolic alteration patterns, strongest around clast peripheries. strongly resembles other basalt from Area F (pc/px/am pxt assemblages), pyroxenes, pc are long, acicular, like hornblende in schist. Serves as substrate for ±1mm-thick, dendritic (internal struct), 1 generation ferromanganese crust with finely nodose surface topography.

probably same melt, may be different flow units

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~~Basalt~~ → -do-

Yellowish olive gray (5 GY 7/1) to olive gray (5Y 5/1) (altered rim)

Phyric, intergranular(?)

→ -do- pc = ±3%, ±2mm dia; px = ±3%, ±1mm dia — most frequently glomerophyric

→ -do?

→ -do-

moderately extensive argillation [smectite] and hydration

**Remarks:** pebble-to-cobble-size intraclasts set in Volcanogenic Conglomerate #I (7 [illegible]) more crystalline than other basalts from this seamount, but probably derived from same magma chamber (pc/px/am assemblage; plagioclase & pyroxene are short & stubby, (unlike 7/DK6), most often glomerophyric with each other (subophitic intergrowth of pc partially-enclosing pc), rarely amphibole dense, no flow structure evident (unlike 7/DK6); evidence of subaerial exposure from rounding of clasts and weathering aureoles peripheral to clasts; serves as substrate for ±1mm-thick ferromanganese crust (dendritic internally, finely nodose extern[illegible]). Curiously weathered (or hydrothermally altered) externally to pale yellowish-green (10 GY 7/2) — mistaken for nontronitized trachyte in hand specimen

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**Rock Type:** Basalt, (Px-Alkalic?) → -do-

**Color:** pale greenish-yellow (10Y 8/2) to pale yellowish-green (10GY 7/2) (externally) to yellowish-gray (5Y 7/2) to medium dark gray (N4) internally

Colors vary strikingly in concentric aureole: outermost very altered to innermost (core) — least altered: Light brown (5YR 6/0), pale greenish-yellow (10Y 8/2), yellowish-gray (5Y, pale yellowish-brown (10YR 6/2), olive black (5Y

**Texture:** Microphyric, intergranular?! (most pheno crysts are single) Strong flow structure & flow banding ≠ → -do-, phyric

**Phenocrysts:** Plagioclase - ±5%, ±1mm dia
Pyroxene - ± 5%, "
Amphibole?! - <1%, "
→ -do-; pc, ± 2%; px, ± 2%; am, ± 1%

**Groundmass:** plagioclase, pyroxene, glass ?!, opaques, amphibole? (not determined) → -do-

**Vesicles:** % varies from ± 3 – ±10% (abundance varies from band to band)
Shape: irregular, elongated in direction of flow
Size: ± 0.75 mm
Filling: usually lined with calcite?! or zeolites?!
→ -do-, ± 3% only; calcite, smectite

**Remarks:** pebble-to-small cobble-size angular-to-subangular clasts loose and set in volcanogenic breccia ± I (71DK 2), pieces ≠ are usually altered to pale greenish or yellowish color - mistaken for trachyte; strong flow structure and flow banding ≠ with acicular crystal phases and vesicles oriented with direction of flow; probably derived from the same magma batch as other basalts from this dredge as mineral phases and textures are very similar; serves as substrate for thin veneer of black, finely botryoidal ferromanganese oxide
→ -do-; but set in Volcanogenic breccia ± 2
— not the same
— -do-
→ but up to 1cm thick and quite dense

**Alteration:** extensive to complete (argillation [smectite], hydration, zeolitization) freshness varies from band to band; porphyries are most altered in an erratic fashion → -do-

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Rock Type: Phosphorite

Color: Grayish-orange 10YR 7/4

Texture: finely granular, (dense, interlocking grains)

Matrix: foraminiferal tests, almost completely lost by conversion to apatite, condensation to dia

Cement: Phosphorite (francolite?), virtually indistinguishable from matrix.

Average grain size: probably < 0.005 mm

" " Shape: probably short acicular

Sorting: probably of uniform grain size at the submicroscopic level

Porosity: < 1%.

permeability: none

Alteration: complete (phosphorization of original $CaCO_3$ chalk, oxidation of siderite?) component of foraminiferal tests

Remarks: rounded, flat pebble-size clasts found loose in dredge; coloring is mottled, occasional "ghosts" of foraminiferal tests visible; surface topography is marred by narrow dia. bore holes (worm?, clam?)

72 DK