

TABLE 3.—Quantitative petrographic summary of chemically analyzed rocks from Umnak and Bogoslof Islands

[Numbers of columns correspond to those in table 2]

Geological Survey

Bulletin 1028-L, Table 3

	Northeastern Umnak																				
	1	1A	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Mode (volume percent): ¹				1										1.1			0.6				
Xenolithic fragments																					
Crystals or phenocrysts >0.2 mm:																					
Plagioclase			36	1	20.8	30.2	28.9	16.8	² 4	68.5	2.0	0.1	8.2	1.8	0.9	0.2	2.6	4.7	³ 0.5	0.5	
Augite		0.1	.1	<.1	12.5	.2	1.1	1.1	² 1	20.6	.2		2.3	1.1	.1	.1	1.6	.3	³ .2	.5	
Olivine	22.2	14.2	6	.1	6.8	.7	.9	1.5		1.8	.1	<.1	.5	<.1	.05	.01	<.1	<.1	<.1	.1	
Opaque oxides	.05									4.5				.1	.1	.1	.1	.2	<.1	.1	
Groundmass or intersertal material	77.7	85.7	58	⁵ 98	59.9	74.8	69.1	80.6	⁵ 95	4.6	97.8	99.8	⁶ 89	95.9	98.9	99.6	⁷ 95.1	94.7	<.1	98.9	
Composition of less calcic plagioclase crystals ⁹			An ₈₅₋₉₀	An ₇₀₋₈₀	An ₈₇₋₉₄	¹⁰ An ₉₀₋₉₅	An ₈₉₋₉₃	An ₇₈₋₉₃	An ₄₈₋₅₀	An ₃₄₋₉₃	An ₈₃₋₉₂	An ₇₈₋₈₇	An ₈₀₋₈₈	An ₄₂₋₅₀	An ₉₀₋₉₄	An ₈₀₋₈₈	An ₄₃₋₈₀	An ₈₁₋₈₇	An ₄₃₋₈₈	An ₈₀₋₇₀	
Composition of more calcic plagioclase crystals ⁹																					
Estimated average composition of less calcic plagioclase crystals			An ₇₇	An ₇₅	An ₉₁	¹⁰ An ₉₃	An ₉₁	An ₈₄	An ₄₇	An _{75(?)}	An ₈₈	An ₈₃	An ₈₈	An ₄₆	An ₉₁	An ₈₅	An ₄₃₋₈₀	An ₈₁₋₈₇	An ₄₃₋₈₈	An ₈₀	
Estimated average composition of more calcic plagioclase crystals																					
Approximate composition of groundmass plagioclase (±An ₈)	An ₇₅	An ₇₅	An ₈₅		An ₇₀	An ₈₅	An ₇₀			An _{85(?)}	An ₆₀	An ₈₀	An ₆₀	An _{42(?)}	An _{75(?)}	An ₈₇	An ₈₄			An ₈₅	
Average beta index of augite crystals ¹¹					1.695	1.703	1.698	1.695		1.697	1.706	¹² 1.699		1.698		1.700	¹³ 1.710			1.705	
Average 2V of augite crystals ¹⁴					54½°	55½°	54°			48°-54°		¹² 35°									
Composition of olivine crystals ¹⁵	FO ₉₁₋₉₀	FO ₇₈₋₈₀	FO ₈₈₋₇₈		FO ₇₈₋₈₈	FO ₈₈₋₇₈	FO ₇₈₋₈₀	FO ₇₈₋₇₈		FO ₈₉₋₇₁	FO ₇₀₋₇₈	FO ₈₀₋₈₉		FO ₈₈₋₇₃		FO ₈₀₋₇₀	¹⁶ FO ₂₃₋₂₉	FO ₃₀₋₃₈	FO ₇₂₋₇₂	FO ₇₃₋₈₁	
Estimated average composition of olivine crystals	FO ₈₈	FO ₇₈	FO ₇₅		FO ₈₄	FO ₇₁	FO ₇₈	FO ₇₇		FO ₈₅	FO ₇₃	FO ₈₆		FO ₇₀		FO _{80(?)}	FO ₂₆	FO ₃₃	FO ₇₂₋₇₂	FO ₇₈	
Refractive index of groundmass or intersertal glass				¹⁷ 1.575					¹⁷ 1.560	1.50		1.500			1.515			1.511	1.520	1.497	

	Southwestern Umnak															Bogoslof	
	21	22	23	² 24	² 25	² 26	27	² 28	² 29	30	31	32	33	34	² 35		
Mode (volume percent):																	
Crystals or phenocrysts >0.2 mm:																	
Quartz			1.2		10.2	4											
Potassium feldspar					5.9	13		<0.1					0.6	28.7			
Less calcic plagioclase			7.6	29.1										24.7			
More calcic plagioclase	1.2		1.3	2.5	64.9	71	.3	1.9	3.8	72	1.8	3.3	43.7	<0.1	26.5		
Biotite (and minor chloritic alteration)					8.4							.1	.8	19.6	3.0		
Amphibole (includes decomposed amphibole)			¹⁰ .7		3.2	10					10	.8	18.3				
Clinopyroxene (epidote in column 33)			2.7	6.2	5.4	.7						.1	.1	²⁰ 5.5	6.1		
Orthopyroxene: hypersthene			.4	2.9	.2							.2	2.6	10.6	2.0		
Olivine	.1		7.6	.3													
Apatite (includes 0.2 sphene in column 35)					.3	.2											
Opaque oxides			.3	.1	1.5	1.1											
Groundmass or intersertal material	98.7	78.2	58.9	<.1			99.5	96.5	95.3			.2		1.9	1.2		
Composition of less calcic plagioclase crystals ⁹							An ₃₀₋₃₅	An ₃₈₋₈₂	An ₄₈₋₈₀	An ₄₈₋₅₅	An ₃₈₋₈₈	An ₄₈₋₅₅	An ₄₈₋₅₅	An ₂₀₋₄₂	60.9		
Composition of more calcic plagioclase crystals ⁹							An ₂₀₋₄₀	An ₇₈₋₈₈	(absent)	An ₃₃	An ₄₀	An ₃₃	An ₃₃	An ₇₈₋₉₄	An ₂₅₋₅₀		
Estimated average composition of less calcic plagioclase crystals							An ₃₀	An ₆₀	(absent)	An ₃₃	An _{40(?)}	An ₃₃	An ₃₃	An ₇₈₋₉₄	An ₇₈₋₉₄		
Estimated average composition of more calcic plagioclase crystals							An ₃₀	An ₅₂	An ₅₄	An _{40(?)}	An ₅₄	An ₅₂	An ₅₂	An ₇₈₋₉₄	An ₄₅		
Approximate composition of groundmass plagioclase (±An ₈)	An ₇₅	An ₈₀	An ₈₅		An _{40(?)}		An _{45(?)}			An _{40(?)}				An ₈₅	An ₈₅		
Gamma index of biotite crystals ¹¹					1.66	1.64											
Beta index of amphibole crystals ¹¹					1.67	1.674											
Beta index of ferrous ²¹ clinopyroxene crystals ¹¹					1.697	1.700											
Beta index of calciferous ²⁴ clinopyroxene crystals ¹¹					1.705	1.704											
2V of ferrous clinopyroxene crystals ¹⁴					50°												
2V of calciferous clinopyroxene crystals ¹⁴					53°												
Composition of hypersthene crystals ²⁵							En ₅₅₋₅₈	En ₅₇	En ₅₇₋₈₂	En ₆₀	En ₅₇₋₈₁	En ₅₉	En ₅₉₋₅₅				
Average composition of hypersthene crystals																	
Composition of olivine crystals ¹⁵	FO ₈₈₋₇₇	FO ₈₄₋₈₈	FO ₈₈₋₇₈						FO ₈₇₋₇₂	FO ₇₀							
Average composition of olivine crystals	FO ₇₄	FO ₈₈	FO ₇₄														
Refractive index of groundmass or intersertal glass							1.543	1.505	1.499			1.514		1.498			

¹ Determined by point counter described by Chayes (1949).
² Minimum size of crystals about 0.1 mm; modes of intrusive rocks include somewhat smaller crystals.
³ Visual estimate. Rare hypersthene also present.
⁴ "Ghosts" of olivine, now antigorite, penninite, quartz, and magnetite.
⁵ Includes palagonitized glass, zeolites, etc.
⁶ Includes 0.6 percent of calcite and 2 percent of chlorite, antigorite, quartz, and zeolites.
⁷ Includes 0.1 percent of zeolite-filled vesicles.
⁸ Includes felsic groundmass with microveinlets of quartz, zeolite, and magnetite.

⁹ Plagioclase compositions from refractive index data, using curves by Calkins-Hess (Kennedy, 1947, fig. 1) and by Tsuboi (1925, pl. 1). Most determinations within ±An₈, limit, ±An₈.
¹⁰ Based on optical determination of refractive indices; partial analysis for alkalis (Na+K, 1.14 percent) indicates composition of An₉₁.
¹¹ Refractive indices determined with sodium light at 25° C. ±2° C. Most measurements within 0.003, excepting those on hornblende.
¹² Data on groundmass augite.
¹³ Diopside augite (β=1.696) also present; probably xenocrysts.
¹⁴ 2V measurements on grains in thin section, using 4-axis universal stage; average of several readings, except for No. 9, in which full range of 2V variation of augite is shown.

¹⁵ Olivine composition from refractive index data, using curves by Bowen and Schairer (Kennedy, 1947, fig. 6). Most determinations within ±FO₁.
¹⁶ Also at least two additional olivines, probably xenocrysts, with overall range of composition from FO₈₈ to FO₈₁.
¹⁷ Data on unpalagonitized clear glass.
¹⁸ Bleached biotite; probably a chlorite.
¹⁹ Entirely decomposed to opaque oxide-clinopyroxene aggregate.
²⁰ Largely decomposed to secondary minerals: opaque oxide rims, clinopyroxene, fibrous green mica and amphibole, sodic plagioclase, brown glass with apatite needles, and carpholite(?).

²¹ Determination by refractive indices (α=1.527-8; γ=1.538) indicates nearly pure albite.
²² A few plagioclase crystals are zoned through entire range, An₃₈₋₈₈.
²³ Includes ferrous augite and ferroaugite following classification of Poldervaart and Hess (1951, p. 474).
²⁴ Includes diopside augite, salite, and ferrosalite following classification of Poldervaart and Hess (1951, p. 474).
²⁵ Orthopyroxene composition from refractive index data, using curves by Hess (Kennedy, 1947, fig. 3).