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

[Numbers of columns correspond to those in table 2]

	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]																					
Xenolithic fragments				1										1.1			0.6				
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	[4] .5	<.1	.05	.01	<.1	<.1	<.1	.1	
Opaque oxides	.05									4.5				.1		.1	.1	.2	<.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	99	98.9	[8] 100.0
Composition of less calcic plagioclase crystals [9]																			An_{50} (rare)		
Composition of more calcic plagioclase crystals [9]			An_{65-90}	An_{70-80}	An_{87-94}	[10] An_{90-95}	An_{89-93}	An_{78-93}	An_{45-50}	An_{34-93}	An_{83-92}	An_{78-87}	An_{80-86}	An_{42-50}	An_{90-94}	An_{80-86}	An_{43-60}	An_{43-58}		An_{55-70}	
Estimated average composition of less calcic plagioclase crystals														An_{72-90}		An_{80-85}	An_{81-87}				
Estimated average composition of more 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}	$An_{58(?)}$	An_{55}	An_{51}	An_{50}		
Approximate composition of groundmass plagioclase ($\pm An_5$)	An_{75}	An_{75}	An_{55}		An_{70}	An_{65}	An_{70}				$An_{85(?)}$	An_{60}	An_{60}	An_{80}	$An_{75(?)}$	An_{87}	An_{84}				
Average beta index of augite crystals [11]					1.695	1.703	1.698	1.695		1.697	1.706	[12] 1.699		$An_{42(?)}$						An_{25}	$An_{5(?)}$
Average 2V of augite crystals [14]					54½°	55½°	54°	54°		48°–54°		[12] 35°		1.698		1.700	[13] 1.710		1.705	1.712	
Composition of olivine crystals [15]	Fo_{81-90}	Fo_{75-80}	Fo_{69-78}		Fo_{76-86}	Fo_{68-75}	Fo_{76-80}	Fo_{75-78}		Fo_{59-71}	Fo_{70-75}	Fo_{80-89}		Fo_{68-73}		Fo_{50-70}	[16] Fo_{23-29}	Fo_{30-35}	$Fo_{72-(?)}$	Fo_{73-81}	
Estimated average composition of olivine crystals	Fo_{86}	Fo_{78}	Fo_{75}		Fo_{84}	Fo_{71}	Fo_{78}	Fo_{77}		Fo_{65}	Fo_{73}	Fo_{66}		Fo_{70}		$Fo_{60(?)}$	Fo_{28}	Fo_{33}		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				9			0.6	28.7		
Potassium feldspar				5.9	13	<0.1			5				24.7		
Less calcic plagioclase	1.2	7.6	29.1	64.9	71	.3	1.9	3.8	72	1.8		3.3	43.7	<0.1	26.5
More calcic plagioclase		1.3	2.5									.1		19.6	3.0
Biotite (and minor chloritic alteration)				8.4	10				10			.8	[18] 3		
Amphibole (includes decomposed amphibole)		[19] .7		3.2								.1	.1	[20] 5.5	6.1
Clinopyroxene (epidote in column 33)		2.7	6.2	5.4	.7	.1	1.2	0.1	2	.2			2.6	10.6	2.0
Orthopyroxene: hypersthene		.4	2.9	.2		<.1	.2	0.5		.2		<.1			
Olivine	.1	7.6	.3				.01								
Apatite (includes 0.2 sphene in column 35)				.3	.2				.1				.01		.3
Opaque oxides		.3	.1	1.5	1.1		0.2	.3	2	.2		<.1	.1	1.9	1.2
Groundmass or intersertal material	98.7	78.2	58.9	<.1		99.5	96.5	95.3		97.6	100.0	95.1		62.3	60.9
Composition of less calcic plagioclase crystals [9]	An_{78-84}	An_{55-55}	An_{60-68}	An_{27-59}	[21] An_2	An_{30-35}	[22] An_{58-62}	An_{48-60}	[21] An_2 (absent)	An_{48-55}	[21] An_2 (absent)	An_{30-40}	An_{6-16}	An_{20-42}	An_{25-50}
Composition of more calcic plagioclase crystals [9]		An_{78-84}	An_{88-92}		An_{20-40}	An_{48-55}	An_{78-88}					An_{55-68}		An_{78-94}	An_{78-94}
Estimated average composition of less calcic plagioclase crystals		An_{50}	An_{65}	$An_{40(?)}$	[21] An_2	An_{33}	An_{60}		[21] An_2	An_{62}	[21] An_2	An_{33}	An_{10}	An_{38}	An_{45}
Estimated average composition of more calcic plagioclase crystals	An_{81}	An_{80}	An_{90}		An_{30}	An_{52}	An_{83}	An_{54}				An_{60}		An_{65}	An_{85}
Approximate composition of groundmass plagioclase ($\pm An_5$)	An_{75}	An_{60}	An_{55}				$An_{45(?)}$	$An_{40(?)}$						$An_{55(?)}$	$An_{5(?)}$
Gamma index of biotite crystals [11]				1.66	1.64				1.640			1.68			
Beta index of amphibole crystals [11]				1.67	1.674							1.68	1.64	1.70	1.75
Beta index of ferriferous [23] clinopyroxene crystals [11]		1.710	1.708	1.697–	1.700	1.710		1.705	1.701	1.705				1.705	1.707
Beta index of calciferous [24] clinopyroxene crystals [11]		1.698	(trace?)	1.705		1.704									
2V of ferriferous clinopyroxene crystals [14]		50°	47°	54½°				50½°	48½°	48½°				57°	57½°
2V of calciferous clinopyroxene crystals [14]		53°													
Composition of hypersthene crystals [25]		En_{54-64}	En_{60-64}			En_{55-58}		En_{57-62}		En_{57-61}		En_{50-55}			
Average composition of hypersthene crystals		En_{57}	En_{62}			En_{57}		En_{60}		En_{59}		En_{52}			
Composition of olivine crystals [15]	Fo_{68-77}	Fo_{84-88}	Fo_{68-78}				Fo_{67-72}								
Average composition of olivine crystals	Fo_{74}	Fo_{86}	Fo_{74}				Fo_{70}								
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 $\pm An_3$, limit, $\pm An_5$.

[10] Based on optical determination of refractive indices; partial analysis for alkalis (Na+K, 1.14 percent) indicates composition of An_{91}.

[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] Diopsidic 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 $\pm Fo_2$.

[16] Also at least two additional olivines, probably xenocrysts, with overall range of composition from Fo_{23} to Fo_{81}.

[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, An_{58-88}.

[23] Includes ferriferous augite and ferroaugite following classification of Poldervaart and Hess (1951, p. 474).

[24] Includes diopsidic 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).