PETROLOGY OF THE APOLLO 11 HIGHLAND COMPONENT. S.B. Simon[1], J.J. Papike[1], C.K. Shearer[1] and J.C. Laul[2], 1.) Institute for the Study of Mineral Deposits, South Dakota School of Mines and Technology, Rapid City, South Dakota 57701, 2.) Radiological Sciences Department, Battelle, Richland, Washington 99352.

It has been known ever since the first studies of the Apollo 11 samples (e.g. 1, 2, 3, 4, 5) that in addition to the abundant mare basalt fragments, an exotic feldspathic component was present at the Apollo 11 landing site. Although this discovery was exciting, there are abundant data on the petrology of the Apollo 11 basalts and soils, yet relatively little on the highland component. Pressure of samples from new missions, the generally small size of the highland lithics at the Apollo 11 site, and our then limited knowledge of the highland suite led to this situation. Thus the time is ripe to characterize and interpret the Apollo 11 highland component. In a sense such an exercise is equivalent to a new mission to the highlands with a potential scientific return comparable to that of Luna 20. We are studying highland lithic fragments in the 1-4 mm size fraction and highland clasts in Apollo 11 regolith breccias (6). For this study, 38 highland fragments from coarse fines sample 10085,104 were hand-picked under a binocular microscope in the curatorial facility at JSC. Each of the fragments was split in half. One half was used for preparation of a thin section; the other was sent to J.C. Laul for chemical determination of approximately 30 major, minor and trace elements by sequential INAA. In classifying the fragments we have largely used the scheme of Vaniman et al. (7) and some of the terminology of (8). Modal data and petrographic classifications are given in Table 1. The most abundant rock types are the recrystallized noritic breccias (RNB) and poikilitic rocks (POIK) (7), and their modal mineralogies are illustrated in Fig. 1. Also represented in the suite of 38 samples are feldspathic basalts, anorthosites, feldspathic fragmental breccias (FFB), feldspathic glasses and devitrified glasses and a variety of crystalline breccias. As Table 1 shows, the lithic fragments consist largely of plagioclase, pyroxene, and olivine, with minor amounts of ilmenite, metal, troilite, and mesostasis. Fig. 2 compares the average modal petrology of the thirteen A-11 RNB/POIK's to those for four chemical groups of highland melt rocks discussed by Vaniman and Papike (9), and shows that they are most similar to the high-An anorthositic gabbro suite with respect to feldspar content. Our new chemical data on these fragments presented in a companion paper (10) also support this correlation.

References.

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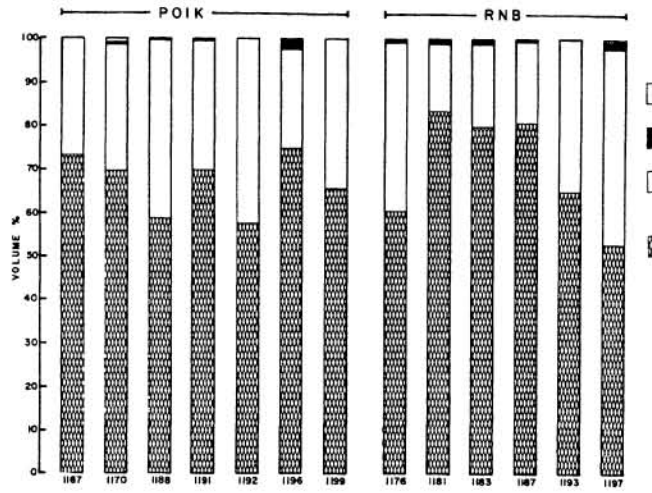
F1



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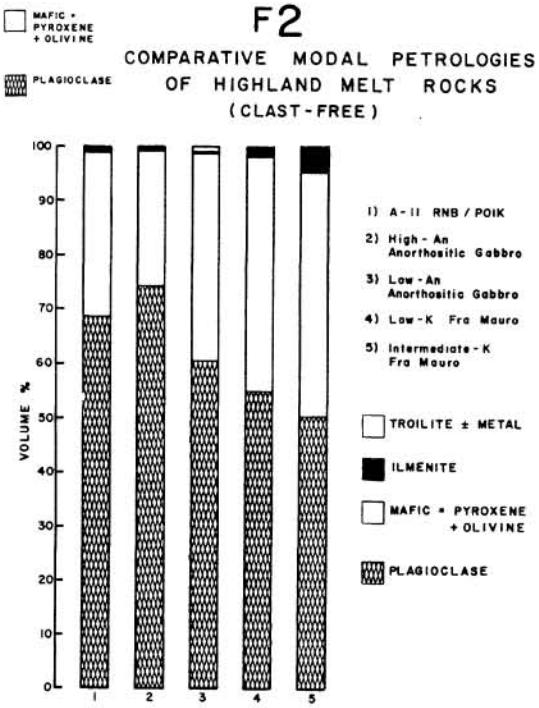

T1

Table 1. Modal Petrology of Apollo 11 Coarse Fines

Sample No. Type	,1163 Breccia	,1164 Feld.Bas.	,1166 FFB	,1167 POIK	,1168 Feld.Bas.	,1169 Breccia	,1170 POIK	,1171 Unique	,1173 Devit.Gl.	,1174 ANT	,1175 Breccia	,1176 RNB	,1177 Anorth.	,1178 Rext.An.	,1179 Unique	,1180 ANT	,1181 RNB	,1183 RNB
Mafic (px + Ol)	19.8	23.8	17.4	26.6	-	38.8	29.0	5.4	-	10.0	67.8	39.2	Tr	-	7.0	5.2	15.6	19.0
Plagioclase	79.4	74.6	81.8	73.4	89.4	61.0	69.8	73.2	-	90.0	-	60.6	100.0	100.0	90.6	79.8	83.6	80.0
Glass	-	-	-	-	9.6	-	-	-	32.4	-	3.0	-	-	-	-	15.0	-	-
Devitrified Glass	-	-	-	-	-	-	-	-	67.6	-	-	-	-	-	-	-	-	-
Ilmenite	0.4	Tr	0.6	Tr	-	0.2	0.4	-	-	-	0.2	0.2	-	-	Tr	-	0.8	1.0
Metal	Tr	Tr	0.2	Tr	-	-	0.6	Tr	-	-	-	-	-	-	-	-	-	Tr
Troilite	0.4	Tr	Tr	Tr	-	-	0.2	0.4	-	-	-	-	Tr	-	Tr	-	Tr	Tr
Mesostasis	-	1.2	-	-	1.0	-	-	1.0	-	-	-	-	-	-	0.4	-	-	-
Lithics	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others	-	0.4	-	-	-	-	-	20.0	-	-	29.0	-	-	-	2.0	-	-	Tr
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sample No. Type	,1185 Breccia	,1186 Devit.Gl.	,1187 RNB	,1188 POIK	,1189 Breccia	,1190 FFB	,1191 POIK	,1192 POIK	,1193 RNB	,1194 Anorth.	,1195 Breccia	,1196 POIK	,1197 RNB	,1199 POIK	,1200 Devit.Gl.	,1213 Devit.Gl.	,1221 FFB
Mafic (px + Ol)	26.2	30.0	19.0	41.0	28.4	20.0	29.6	42.2	35.0	4.4	30.0	23.0	42.8	34.2	2.6	-	5.6
Plagioclase	49.2	-	80.8	58.8	71.2	74.8	70.2	57.8	65.0	95.6	68.0	74.8	53.0	65.8	-	50.8	24.8
Glass	16.4	24.0	-	-	-	4.8	-	-	-	-	1.6	-	-	-	-	-	52.4
Devitrified Glass	-	42.8	-	-	-	-	-	-	-	-	-	-	-	-	97.4	49.2	-
Ilmenite	-	2.6	0.2	Tr	0.4	0.4	Tr	Tr	Tr	Tr	0.4	2.2	4.0	Tr	-	-	Tr
Metal	-	0.6	Tr	Tr	-	Tr	Tr	Tr	-	-	-	-	Tr	Tr	-	Tr	Tr
Troilite	0.2	Tr	Tr	0.2	-	-	0.2	Tr	-	-	Tr	Tr	0.2	Tr	-	-	-
Mesostasis	-	-	-	-	-	-	-	Tr	-	-	-	-	-	-	-	-	-
Lithics	8.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17.2
Others	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

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