LARGE GLASSY OBJECTS FROM APOLLO 16, T. H. See[1], F. Hörz[2], R. V. Morris[2], D. Blanchard[2], and R. S. Seymour[1], [1]Lockheed/EMSCO, 1830 NASA Rd. 1, Houston, Texas 77058, [2]NASA-Johnson Space Center, Houston, Texas 77058

We have continued to study impact melts from Apollo 16 which occur as large drapings or coatings on a diversity of host rocks, as hollow or solid spheres and/or as veins penetrating the rocks. Such impact melts, Large Glassy Objects (LGO's), are particularly abundant at the Apollo 16 site where they possibly reflect either the intense regional cratering history or the presence of the two relatively young impact structures, North Ray and South Ray craters. Our analyses include petrographic description and classification, chemical characterization of major (electron microprobe) and select trace elements (INNA), and ferromagnetic resonance (FMR). Our purpose is to determine the source lithology for these melts, whether from local regolith or a distinct monomict or polymict bedrock lithology, and to determine any systematic compositional difference between Cayley Plains and Descartes Mountain materials.

During the past year we have completed the sample selection and acquisition; a total of 50 individual LGO's are now in hand and include a doubly polished thin section and bulk chips for each sample. The majority of the sample suite was collected in the southern half of the Apollo 16 landing site; characterization of North Ray glasses is being performed elsewhere (1). Petrographic examination of all samples is complete; FMR and trace element analyses are nearing completion and approximately half of the samples have been microprobed.

Petrographically the LGO's vary from holohyaline to predominately devitrified samples consisting of varying amounts of tiny acicular plagioclase laths and aphanitic pyroxenes in a glassy matrix. Approximately half of the samples are at least 80% devitrified or recrystallized with 60% of these being totally devitrified. The majority of the devitrification products are extremely fine-grained except for an occasional large plagioclase lath several millimeters in length. The fine-grained nature of these devitrification products does not allow microprobe analysis of individual phases except for the occasional large feldspar crystal. Therefore, a broad beam analysis is commonly employed and usually closely compares to the composition of glassy areas. Only 6% of the samples are holohyaline and only 12% consist of more than 90% glassy materials. Xenoliths are common in many samples ranging from pieces of the host rock floating in the LGO to compositions totally foreign to the host with many of these clasts exhibiting varying degrees of melting and resorption. In addition these clasts commonly acted as nucleation and/or divitrification centers. Some of the LGO's, the predominately glassy examples, exhibit thin quench zones at the exterior surfaces and along the contact with the host rock. Another feature common to many of the samples is a band of black glass within the contact zone characterized by varying degrees of mixing of melt and host rock, indicating some interaction between the two. Round and/or irregular vesicles are common as well as schlieren in the glassy areas of the LGO's. Some schlieren consist of glasses of varying colors while many are accented by very small spherical blebs of troilite, kamacite, and metal grains of varying compositions. The irregularly shaped vesicles, the often spectacular wispy nature of the schlieren, and melting of the host along contacts indicate high melt temperatures for many of the LGO's at the time of emplacement.

Major element chemistries of LGO's analyzed to date seem to define a linear trend between anorthosite as one end-member and a more mafic composition as the other (figure 1). Within this trend several clusters of samples can be observed. One cluster plots near soils from stations 5, 6, 8, and 9, located northeast of South Ray crater (below Stone Mountain) on the Cayley Plains, although the LGO's generally contain between 1.5 and 3 weight % more (FeO +MnO +MgO) than do the soils. Approximately 75% of these LGO's were collected from stations 4 and 5. Station 4 is located on the slopes of Stone Mountain while station 5 lies at the base of the mountain on the

Cayley Plains. The closest whole rock composition plotting near this cluster is that of a subophitic basaltic impact melt.

Another cluster of LGO's occurs near soils from stations 1, 2, and 13. All of these LGO's were collected from station 10 which is the LM/ALSEP area. Whole rock compositions similar to this group are those of the Glassy Regolith Breccias and the Fragmental Regolith Breccias (2).

The remainder of the LGO's, except 64435, exhibit a varying enrichment of feldspathic components. They plot near the Feldspathic Fragmental Breccias of North Ray and some soils from station 11 located on the southeastern rim of North Ray crater. All LGO's examined to date from station 11 plot in this area as do 25% of those from station 10. Two samples, one each from stations 1 and 10, exhibit a large degree of anorthositic enrichment and may represent a mixture of local soils and underlying anorthosite.

Compositional variations among the LGO's studied thus far have not yielded a link between the LGO's and the composition of any specific parent lithology, whether soil or whole rock. Most LGO's appear to be mixtures of regolith and whole rock compositions or a whole rock melt of a breccia type.

In summary, local Apollo 16 soils, rocks, and/or breccias are viable condidates as parental materials for the LGO's. Hopefully, the completion of the chemical analyses will allow us to better contrain the source materials for these impact melts.

REFERENCE

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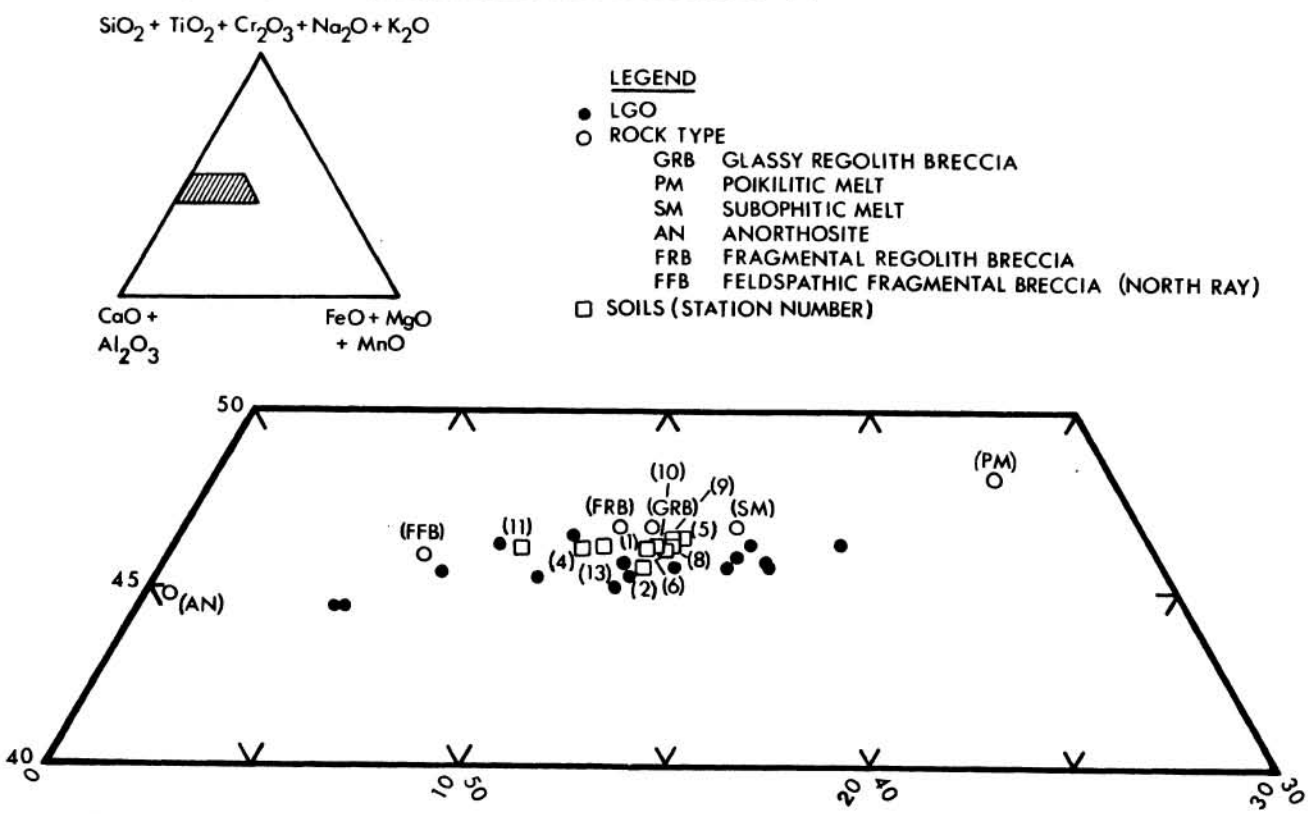

Figure 1. Average compositions of LGO's and other Apollo 16 materials. Data for rock samples taken from Ryder and Norman (2). Average values for soil stations taken from Korotev (3).