WHITE PORTIONS OF APOLLO 16 DIMI :T BRECCIAS ARE POLYMICT. J. P. McKinley, G. J. Taylor, and K. Kei , Inst. of Meteoritics and Dept. of Geology, Univ. of New Mexico, Albuquerque, NM 87131

Apollo 16 dimict breccias consist of light-colored cataclastic anorthosite intermingled with dark-colored impact melt breccia of VHA (20 to 24 wt.% Al_2O_3) composition. They probably originated as impact-melt injection dikes in country rock beneath impact craters [1,2]. It is already established that the dark portions are polymict breccias [3], and we present evidence here that the light portions, though superficially simple, are also polymict. Our conclusions are based on data obtained from rock 64475 and from several rake samples.

The light portions of dimict breccias are cataclastic anorthosites; modal plagioclase is more than 95%. If polymict, they clearly formed from a mixture dominated by anorthosites. Both olivine and pyroxene are present as grains ranging in size from 0.04 to 0.5 mm (average about 0.1 mm) and their compositions plot mostly in the ferroan anorthosite field in Fig. 1. (Fig. 1 was constructed by plotting Mg/(Mg+Fe) of individual pyroxene and olivine analyses versus the average plagioclase composition for each rock.) However, many analyses plot in the gap separating the ferroan anorthosites from the Mg-rich suite of pristine nonmare rocks. This implies either that the cataclastic anorthosites in dimict breccias represent a distinctive suite of pristine rocks whose compositions bridge the gap between the two main groups, or that the light portions of dimict breccias are actually polymict.

We can rule out simple admixture of mafic silicate grains from the melt portions of the dimict breccias as the source for the grains whose compositions fall into this gap. The melt-breccia portions do not contain olivine or pyroxene grains (including clasts) as large as those we analyzed in the light portions. Furthermore, we purposely avoided areas of cataclastic rock adjacent to melt portions. Finally, the compositions of normative mafic silicates in the melt portions are higher in Mg/(Mg+Fe) than the greatest density of gap fillers in Fig. 1.

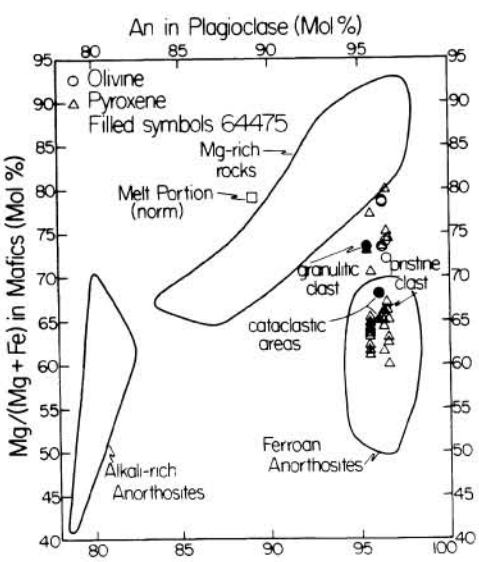

Figure 1.

Study of rock 64475, a 1 kg dimict breccia, sheds light on the nature of the cataclastic portions of dimict breccias and on the source of the mafics plotting in the gap. The cataclastic portion of this rock contains three main lithologies: typical crushed anorthosite; a clast with cumulus texture; and a clast with granulitic texture. In the cataclastic area, pyroxene and olivine range in composition (En 60-67; Fo 65-71), but plot within the ferroan anorthosite field (Fig. 1). Plagioclase is uniform in composition (An 96). Average mineral compositions are plotted in Fig. 1. The clast with cumulus texture occurs in section 64475,61 and was brought to our attention by G. Ryder and M. Norman. It is 5 mm in diameter and consists of blocky plagioclase crystals up to 3 mm across and a few percent of low-Ca pyroxene interstitial to the plagioclase. Mineral compositions are

uniform throughout the clast: plagioclase composition is An 96; pyroxene is exsolved with a host orthopyroxene (En64Wo2) and augite lamellae (En43Wo45). The average bulk pyroxene composition, measured by using a 25 µm electron beam, is En64Wo4. The clast is clearly pristine and, considering the similarities in average mineral compositions to the cataclastic portion of 64475, a lithology like it may have supplied much of the material composing the cataclastic portion of the rock. No olivine is present in the clast, but this may be due to poor sampling, as the average grain size is at least 2 mm and the clast is only 5 mm across.

We searched all pieces of 64475 for more areas with primary igneous texture. None was found, but we discovered in hand specimen 64475,3 a nonclastic area consisting of shiny plagioclase with about 15% of a pale yellowish mineral. The plagioclase exhibited crystal faces, which is rare in the cataclastic portions of 64475 and other dimict breccias, and appeared recrystallized. Some of this recrystallized area (,79) was chipped from ,3 and made into thin sections. Examination of these sections revealed that the nonclastic area is a clast with granulitic texture. Plagioclase ranges in size from 0.3 to 1.8 mm (average about 0.4 mm). Low-Ca and high-Ca pyroxene and olivine are smaller than plagioclase. Minerals vary in composition. Plagioclase ranges from An90 to An97 (average An95); low-Ca pyroxene from about En67 to En75 (average En72Wo2); high-Ca pyroxene from En45 to En47 (average En46Wo41). Olivine is much less abundant than pyroxene and averages Fo73. These mineral compositions plot in the gap between the ferroan anorthosite and Mg-rich fields in Fig. 1 and close to the cluster represented by pyroxenes and plagioclase from other Apollo 16 dimict breccias. We infer from this that the minerals that plot in the gap are probably derived from granulitic rock admixed into the cataclastic anorthosite portions of dimict breccias. This is supported by the fact that other granulitic rocks also plot in the gap [4]. Compositions of metallic Fe,Ni indicate meteoritic contamination; it averages 6.9 wt.% Ni and 0.7 wt.% Co, typical of lunar polymict breccias [5]. Consequently, it seems unlikely that the gap fillers in Fig. 1 are from pristine nonmare rocks. As a corollary, it appears that the anorthosite portions of dimict breccias are actually polymict rocks, not simply ferroan anorthosites. In fact, Kempa and James[6] suggest that several Apollo 16 cataclastic ferroan anorthosites are also polymict.

Dimict breccias form by the injection of impact melt into the rock underlying the floor of a crater [1,2]. Based on the striking uniformity in melt compositions of dimict breccias we argued that these rocks formed in one large event [7,8]. If correct, the target must have consisted of bedrock composed of a mixture of monomict cataclastic anorthosite and polymict granulitic ANT rock (now the white portions of dimict breccias) overlain by rock whose average composition corresponded to VHA basalt; these overlying lithologies might have been a series of KREEPy volcanic rocks.

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