THE LUNAR CRUST IN THE DESCARTES AREA NEAR NORTH RAY, APOLLO 16. II. CHRONOLOGY AND SELENOCHEMICAL INTERPRETATIONS.

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This paper represents the second part of a summary report of the North Ray crater Consortium. The samples dated by the Ar-Ar and the K-Ar techniques have been characterized petrographically and chemically. The results are graphically presented in Figs. 1 and 2. Details of the isotope analyses will be given in separate papers (2, 3) or are published elsewhere (6, 9). In addition to the absolute ages, relative ages have been determined from petrographic analysis of clast-matrix relationships in polymict breccias. A fundamental observation is that all pristine (plutonic) lithologies are found to be clasts within polymict breccias (fragmental, "melt", and granulitic matrix). The typical polymict breccias of the "Old Eastern Suite" (1) — granulites and microporphyritic melt breccias — contain lithic clasts of cataclastic anorthosites, granulites, and rare subophitic melt rocks with VHA-composition but no typical KREEP-bearing impact melt rocks. This implies that granulites and certain VHA-melt lithologies were most probably among the first generation of impact breccias derived from the upper crust some 4.6 by ago (Fig. 2). A large fraction of the feldspathic fragmental breccias (mostly rake samples) is also free of KREEP-bearing melt rock clasts (6) although some of large samples are relatively rich in KREEP lithologies (e.g. 67615). The meaning of this observation will be discussed below.

The major characteristics of the absolute ages are as follows. The total range of Ar-Ar plateau ages of all Apollo 16 cataclastic anorthosites varies from 4.3 to 3.5 AE. At Station 11 the range is between 3.53 and 3.66 AE (2, 3). Most of these samples display high-temperature plateau of 3.79 and 4.0 AE. The young ages obviously reflect later events which reset the crystallization ages of the plutonic parental rocks of 4.4 AE. Present day Sr/Sr ratios of anorthosites 67635, 67594, and 67536 are 0.69957, 0.69680, and 0.70105, respectively and Rb/Sr ratios are 0.00184, 0.00187, and 0.00216, respectively. Model ages based on (U) coincide with the Ar-Ar ages of these rocks. A tentative interpretation of this result would be that Rb was emplaced into the cataclastic anorthosites only at these late time. It is not clear whether a similar effect can be invoked for the feldspathic granulites none of which is older than 3.96 AE (Fig. 11, 12) or whether their ages are basin excavation ages or reflect any other late thermal event (12). One of the dated granulites (67666) belongs to the Mg-noritic anorthosite group but its calculated age of 3.81 AE old suggests that it is 3.81 AE old sample 78215 (3) which is typical for the large Apollo 17 Mg-norite group. The ages of Stations 11 granulites are younger than those of the feldspathic microporphyritic melt breccias (11, 12). This fact supports our conclusion that the feldsparic granulitic breccias (Mg-Fe-poor) represent the youngest generation of feldspathic melt breccias (see chemical data in (11). However, these data reflect the pre-Nectarian anorthosites discussed in Part I of the granulites because their interpretation is controversial and some of the granulites analyzed by the Lunar and Planetary Institute a Provided by the NASA Astrophysics Data System
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Fig. 1: $^{40}$Ar-$^{39}$Ar plateau ages; NW-SE hatched bars = literature data (referenced in 12) and own data; SW-NE-hatched bars = own data (2,5); figures = number of samples.

Fig. 2: A = anorthosite or anorthositic, OGN = olivine gabbro-norite, SFG = sodic ferrogabbro, ST = spinel troctolite, N = norite or noritic, G = gabbro or gabbroic, VHA = very high alumina.

Evaluation of the lunar crust at North Ray

Measured $^{40}$Ar-$^{39}$Ar dates

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