^{40}Ar-^{39}Ar AGES OF APOLLO 16 NORTH RAY CRATER ROCKS AND DIMICT BRECCIAS; T. J. Bernatowicz, M. M. Lindstrom and F. A. Podosek, McDonnell Center for the Space Sciences and Department of Earth and Planetary Sciences, Washington University, St. Louis, MO 63130

The North Ray Crater samples represent material from deeper in the typical highlands crust than those of any Apollo or Luna stations. The feldspathic fragmental breccias at North Ray Crater contain a wide variety of rock types which include both products of early lunar differentiation (ferroan anorthosites and a variety of more mafic igneous rocks) and products of early metamorphism and impact melting (granulitic breccias and impact melt breccias) [1,2]. Understanding age relationships among samples from North Ray Crater can provide a sequence of events in the early evolution of the regolith and be used to relate samples to geologic units [2,3].

Impact melt rocks of VHA (very-high alumina) basalt composition are found among the North Ray Crater samples, but are more common in the dimict breccias from South Ray Crater. A comparison of ages of VHA melts from the two sources will help us evaluate whether they represent a singe or multiple impact events.

The samples selected for dating span the range of typical North Ray Crater materials. All samples have been previously characterized petrographically and compositionally. The first two are hand specimen samples of granulitic breccias which are the best examples of the ferroan and magnesian subdivisions [4]. 67415 is a cataclastic granulite with a simple crushed texture of an annealed rock while 67215 is texturally more complex but represents a ferroan end-member composition.

The remaining four samples are fragments of breccias which have been studied in detail by consortia headed by U. Marvin and O. James. The two samples from North Ray Crater breccia 67015 [5] are a feldspathic fragment-laden melt breccia (,320) and a VHA basalt impact melt (,321). The two samples from dimict breccia 61015 [6] include the VHA basalt melt rock (,100) and the glass coat (,90).

This suite of lunar samples, together with appropriate monitors for production of Ar isotopes from K and Ca and for spatial variation of neutron fluence, were irradiated at the Research Reactor Facility, University of Missouri (Columbia); the laboratory designation for this irradiation is SLC-10. Ar released in stepwise heating was analyzed in a Reynolds-type spectrometer in static mode.

Results for the full suite of six samples will be reported later. Here we show results for 67415 and 67215. Apparent-age release diagrams are shown in Fig. 1, and a summary of results is given in Table 1. Apparent ages are computed from $^{40}Ar/^{39}Ar$ ratios, compared to the hb3gr monitor, corrected for blanks, irradiation interferences, and fluence variations; statistical errors are one standard deviation. The errors for 67215 are relatively large because of its very low K concentration. Cosmic-ray exposure ages, based on ^{38}Ar production, are consistent with the well-known age ($\sim$50 Ma) of North Ray Crater [7].

Within the limits of statistical uncertainties (fairly broad for 67215), interpretation of the apparent-age release patterns is straightforward. Both rocks exhibit age plateaus with no greater complication than very modest low-temperature loss of radiogenic ^{40}Ar. Both rocks have plateau ages consistent with the $\sim$3.9 AE age common at Apollo 16 and other highland sites, with no evidence for events at significantly greater or lesser ages.

Table 1. Summary of ^{40}Ar-^{39}Ar results

Sample	Weight (mg)	[K] (weight %)	[Ca]	Exposure Age (MA)	Plateau Age (GA)
67415,33	89	.026	10.7	47	3.96 ± .04
67215,8	86	.0096	10.7	52	3.75 ± .11

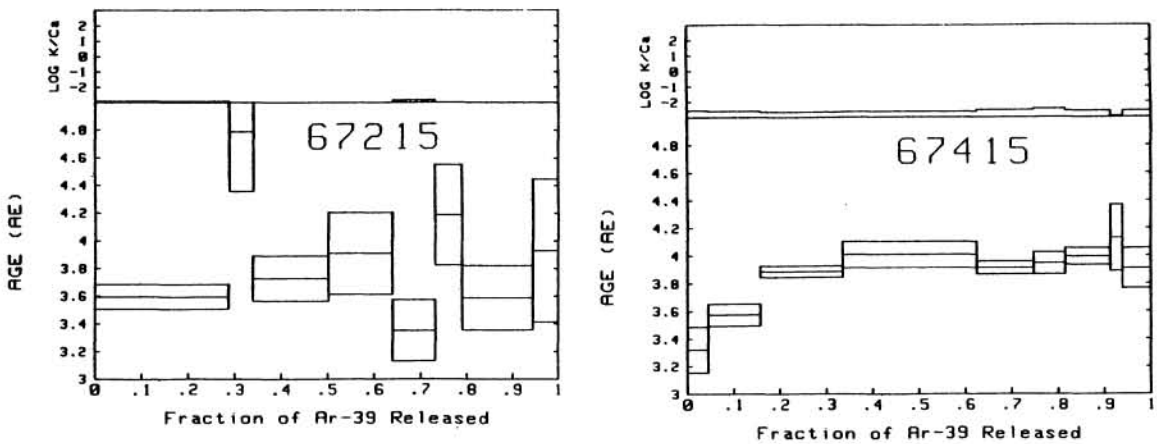

Figure 1. ^{40}Ar-^{39}Ar apparent age spectra for 67415 and 67215.

References:
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