

^{40}Ar - ^{39}Ar AGES OF APOLLO XIV AND XV SAMPLES, Derek York, W. John Kenyon and Roy J. Doyle, Department of Physics, University of Toronto, Toronto, Canada.

Introduction Nine controlled heating analyses have been performed on neutron-irradiated samples of Apollo XIV and XV materials. The results are summarized in the table and the figure.

Apollo XIV Analyses 14072,6 Controlled heating runs were carried out on two neutron-irradiated fragments of igneous rock 14072,6. Low $^{40}\text{Ar}/^{39}\text{Ar}$ ratios in the low temperature fractions indicate slight argon loss. The remaining 95 per cent of the gas released, however, has $^{40}\text{Ar}/^{39}\text{Ar}$ ratios corresponding to ages in the range 3.83-4.07 b.y. Evidently less than 5 per cent of the radiogenic argon has been lost from this sample and total gas ages of 3.94 and 4.02 b.y. were found. Both analyses appear to show a very slight drop in $^{40}\text{Ar}/^{39}\text{Ar}$ ratios in the mid-upper temperature range. It seems that this rock crystallized on the moon about 4.0 b.y. ago and its Ar/K ratio has not been seriously disturbed since. 14167,9 Two basaltic fragments of the 2-4 mm fines were analyzed. The $^{40}\text{Ar}/^{39}\text{Ar}$ evolution patterns are clearly reproduced between runs. The pattern, in fact, is apparently an exaggerated version of that of 14072,6. Low $^{40}\text{Ar}/^{39}\text{Ar}$ ratios are apparent in low temperature fractions while the largest volumes are evolved in the middle temperature range with equivalent ages of 3.84-3.97 b.y. There is again a diminution in $^{40}\text{Ar}/^{39}\text{Ar}$ ratios at higher temperatures, but in this case much more pronounced. As yet, there is no definitive explanation of this effect. We tentatively take the plateau ages of 3.91 and 3.95 b.y. as indicating the age of crystallization of these fragments. 14321 Three basaltic clasts from this breccia have been examined (184,1D;184,12B;184,17B). The results for 184,1D are shown in detail in the figure. The tendency for the $^{40}\text{Ar}/^{39}\text{Ar}$ ratios to sag in the mid-high temperature range is again apparent. Despite this, only about 5 per cent argon loss is apparent for this sample which has a plateau age of 3.90 b.y. and a total gas age of 3.84 b.y. The evolution spectra of the other two clasts 184,12B and 184,17B are very similar having plateau ages of 3.99 and 3.95 b.y. respectively. These fragments evidently crystallized 3.9-4.0 b.y. ago. They are also notably low in trapped

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argon component. In summary, three different Apollo XIV source materials (basalt, coarse soil, breccia) all yield apparent $^{40}\text{Ar}/^{39}\text{Ar}$ ages in the range 3.95 ± 0.15 b.y. indicating a significant event occurred on the moon at this time. Its relationship to the excavation of the Imbrium basin is still not clear, however. Approximate ^{38}Ar exposure ages of between 20 and 30 m.y. probably date the formation of cone crater.

Apollo XV Analyses Two controlled heating analyses were performed on basalt 15,555,26. The sample appears to have lost a little over 20 per cent of its argon. 50 per cent of the ^{39}Ar is released in the temperature range 860-1175°C with essentially constant $^{40}\text{Ar}/^{39}\text{Ar}$ ratios (after corrections). Plateau ages thus found for the two runs are 3.29 and 3.32 b.y. This sample, therefore, probably crystallized on the moon 3.31 ± 0.05 b.y. ago. An approximate exposure age of 75 m.y. is found. Both analyses give evidence of high temperature diminution of $^{40}\text{Ar}/^{39}\text{Ar}$ ratios, this time in the last 5 per cent or so of the gas released.

Plateau, Total Gas and Cosmic Ray Exposure Ages
for Apollo XIV and XV Samples

<u>Sample</u>	<u>Plateau Age (b.y.)</u>	<u>Total Gas Age(b.y.)</u>	<u>Cosmic Ray Exposure Age (m.y.)</u>
<u>Apollo XIV</u>			
14167,9 2-4mm Fines, I	3.91	3.66	26
14167,9 2-4mm Fines, II	3.95	3.63	27
14072,6 Igneous Rock I	4.01	3.94	19
14072,6 Igneous Rock II	4.06	4.02	22
14321,184,1D Basalt Clast	3.90	3.84	
14321,184,12B Basalt Clast	3.99		
14321,184,17B Basalt Clast	3.95		
<u>Apollo XV</u>			
15555,26,I Basalt	3.29		81
15555,26,II Basalt	3.32	2.91	72

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