^{40}AR-^{39}AR RESULTS OF LUNAR METEORITES DHOFAR 025, 280, 309, 730, 733, 1436, 1442, SAU 449, NWA 6888.

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^{40}Ar-^{39}Ar dating is one of the most important tools to decipher lunar chronology. High-resolution ^{40}Ar-^{39}Ar stepwise heating analyses on a series of lunar meteorites (Dho 025, 280, 309, 730, 733, 1436, 1442, SaU 449, NWA 6888) have been carried out at Heidelberg University to provide new insights into lunar chronology. KREEP-rich Dho 1442 is related to mingled lunar meteorites, the others to feldspathic [1]. This is the first chronological study for the most of these specimens.

All studied meteorites show high temperature Ar release (>1100°C) typical of strongly shocked or melt rocks [2] and a low temperature reservoir (<900°C). The age spectra of the samples without proper correction for trapped components (lunar and terrestrial) display excess ages, frequently >4.6 Ga. In Dho 025, 1436, 1442, and NWA 6888 the lunar trapped Ar component is abundant and prevailing over low temperature atmospheric trapped argon. The concomitant release of lunar and terrestrial trapped components precludes the evaluation of chronological information for low temperature extractions in Dho 025 and 1436. In Dho 280 and 730, trapped terrestrial (atmospheric) and lunar argon are released at different temperature regimes. Isochron analyses allow the evaluation of the composition of trapped extraterrestrial Ar with high precision especially in meteorites enriched in "parentless" ^{40}Ar. The extraterrestrial $(^{40}Ar/^{36}Ar)_{trapped}$ ratio varies from 2.5 to 18 in Dho 025, 280, 1436, 1442, SaU 449 and NWA 6888 that broadly agrees with lunar orphan argon composition according to the antiquity model [3,4]. On the other hand, the high temperature fractions of Dho 730 contain excess argon with $(^{40}Ar/^{36}Ar)_{trap}$ ratio of ~92 [5], atypical of lunar orphan argon.

Although most samples (Dho 025, 309, 730, 733, 1436 1442, SaU 449) display high temperature ^{40}Ar-^{39}Ar plateau ages between 3.0 and 4.2 Ga common for lunar rocks, only Dho 025, Dho 309 and Dho 1436 are compellingly consistent with the late heavy bombardment (LHB) cratering period [6]. Dho 733 has the oldest age of ~4.2 Ga within this series of meteorites.

Dho 280, 733, 1442, and NWA 6888 were affected by young impact events ≤ 1 Ga ago which was also recorded by other lunar meteorites [7-10]. This implies an important role of recent impact events in shaping the lunar relief. In Dho 280 and 1442 such event(s) caused partial Ar loss not only of radiogenic but also of cosmogenic isotopes accumulated during long irradiation on the lunar surface.Thermal loss of cosmogenic argon allowed to distinguish different irradiation periods (2π before, and 4π after ejection) in Dho 280 using the ^{37}Ar-$^{38}Ar_{cos}$ cosmic-ray exposure (CRE) age spectrum [11].

Dho 733 is the only one of studied meteorites that unambiguously has a simple irradiaton history indicating a short transit time (~0.5 Ma) similar to that of most lunar meteorites [12]. This agrees with a deep origin of this rock [1]. All other samples were irradiated by GCRs from several to hundreds of Ma. The maximum values of the $(^{36}Ar/^{38}Ar)_{total}$ ratios in individual temperature extractions of gas-rich Dho 1436 and NWA 6888 samples are 5.43±0.03 and 5.44±0.03, respectively, and were used as the lower limits of the trapped endmember composition for CRE age evaluation.

Literature data [13-15] and most of our results are discordant with the empirical antiquity model [3,4]. Alternatively, "orphan" argon of these breccias exposed to multiple impact events may have an impact origin [5].

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