Poster # 4 (Virtual, discussion and time for friendly questions & answers will be provided for.)

^{40}AR/^{39}AR Ages For Lunar Basaltic Meteorites Northwest Africa 8632 And 12008.

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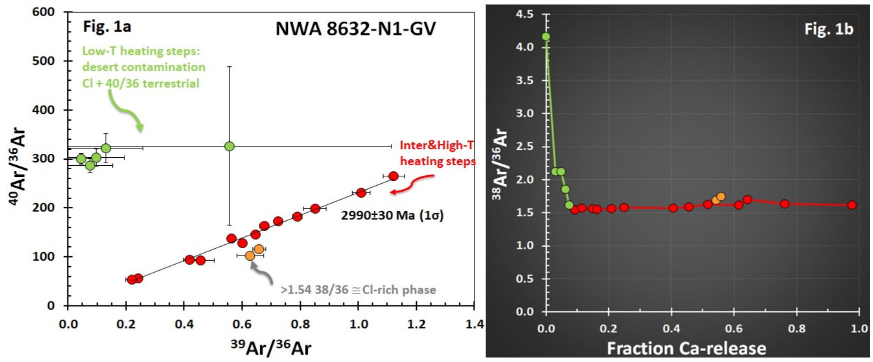
Introduction: Basaltic lunar meteorites are important supplements to samples collected by Apollo and Luna missions, potentially sourced at other flows of the same mare, or other maria not sampled by these missions. The outcome is a better survey of chemical, isotopic and chronologic information on overall heterogeneities of lunar mantle source areas and processes that permitted protracted lunar volcanism. Chang'e-5 mission basalts collected at NW of Procellarum region on lunar nearside are youngest material ever dated, 2030±4 Ma and derived from a source not involving KREEP [1-4]. Here we report new ^{40}Ar/^{39}Ar ages for lunar basaltic meteorites Northwest Africa 8632 (NWA 8632) and Northwest Africa 12008 (NWA 12008).

Methods: ^{40}Ar/^{39}Ar analytical method requires that samples are neutron-irradiated prior to measurements, and then inserted in vacuum sealed chamber attached to a noble-gas mass-spectrometer. The sample is heated in progressively hotter heating steps, here using an IR-laser. Gas released at each step is measured for $^{40-36}$Ar. Data are corrected for blank, discrimination, decay of short-lived nucleogenic nuclides (^{37}Ar, ^{39}Ar), and if necessary also for cosmogenic and/or trapped Ar. Isotope correlation diagrams are preferred to age-spectrum for optimal interpretation of Ar distribution and assess different components (e.g. solar, cosmogenic, radiogenic; [e.g.5,6]).

Samples: NWA 8632 and NWA 12008 basalts are 2 of the known 15 unbrecciated lunar basaltic meteorites. Basalt NWA 8632 is low-Ti basalt similar in composition to, but petrologically distinct, NWA 032/479 and Apollo 12 pigeonite basalts [7]. Previously reported ^{40}Ar/^{39}Ar data suggested an age of 2877±34 Ma [8]. NWA 12008 is also a low-Ti basalt with major and REE composition similar to, but petrologically distinct, NWA 032/479, NWA 4734 and LAP02024-clan [9]. No chronology has of yet been reported for this meteorite.

Results: Data acquired over 23 to 132 heating-steps provide high resolution gas release to better disentangle different Ar-components. Both basalts show at low-T heating steps dominant excess ^{40}Ar component corresponding to old ages (Fig.1a). Intermediate- and high-T steps show a mixture of trapped, but dominated by, radiogenic ^{40}Ar confirmed by cosmogenic ^{38}Ar/^{36}Ar values (Fig.1b). Sample NWA 8632 high-T steps show release of Cl-derived ^{38}Ar potentially related to Cl-phosphate (Fig.1a&b). The ^{40}Ar/^{39}Ar ages calculated from intermediate and high-T steps isochrones are 3038±60 Ma (2σ) for NWA 8632 (average n=2), and 2815±70 Ma (2σ) for NWA 12008.



Discussion/Summary: Lunar basaltic meteorites range from very low- to low-Ti with a wide age range from ~4369 Ma to ~2815 Ma (~1500 Ma volcanic activity), and range in Mg# and REE composition. Earlier work by [10] proposes NWA 12008 underwent short duration shock metamorphism, suggesting the 2815±70 Ma likely corresponding to its formation age. P-T modelling of different lunar basalt sources [11] show wide range in temperature and depths independent of their age: 1370°C and 175 km for NWA 8632, and 1260°C and 50 km for NWA 12008 [11].

References: **[1]** Li et al. (2021) Nature 600:54–58. **[2]** Che et al. (2021) Science 374:887-890. **[3]** Tian et al. (2021) Nature 600:59–63. **[4]** Hu et al. (2021) Nature 600:49–53. **[5]** Fernandes et al. (2013) MaPS 48:241–269. **[6]** Assis Fernandes et al. (2021) DINGUE Workshop 2021. **[7]** Korotev et al. (2015) 46th LPCS, abst.#1195. **[8]** Fagan et al. (2018) 49th LPSC:abst.#2584. **[9]** Cohen et al. (2019) 50th LPSC:abst.#2508. **[10]** Zhang et al. (2019) 82nd MetSoc: abst.#6117. **[11]** Assis Fernandes et al. (in preparation).