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NORTHWEST AFRICA 10639 AND 10640: TWO NEW MONOMICT EUCRITES FROM SAHARA.

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Introduction: These two meteorites were purchased in 2015 at the Erfoud Market by Hichame Mimaghador, from a Moroccan dealer. The main masses, weighing 232 and 41.9 g, respectively, are both partially covered by a black fusion crust. The sawn surface of both samples shows a brecciated texture with white clasts set in a fine grained matrix. Both meteorites have been approved by the Nomenclature Committee of the Meteoritical Society with the names NWA 10639 and 10640, respectively [1]. Hichame Mimaghador owns both the main masses. The type specimens, weighing 36.2 and 8.4g, respectively, and two thin sections are on deposit at the Museo di Storia Naturale dell'Università di Firenze (sample N° RI-3233 and RI-3234).

Instruments and methods: Optical microscopy was undertaken at the laboratories of the Dipartimento di Scienze della Terra, Università di Firenze, Italy, using an Axioplan-2 polarizing optical microscope equipped with Axiocam-HR camera. SEM-SE images have been performed at the Dipartimento di Chimica, Università degli Studi di Firenze laboratories by means of a Hitachi SEM. EMPA-WDS analyses have been performed at the Firenze laboratories of the IGG – CNR (National Council of Research) with a Jeol Microbeam microprobe. Oxygen isotope analysis was undertaken at the Open University.

Experimental results: Both meteorites were investigated by means of optical microscopy, SEM, EMPA and Micro-Raman techniques. A thin section of each sample was analyzed. Both thin sections displays a monomict brecciated texture consisting of basaltic eucrite clasts and related crystalline debris set in a finer-grained homogeneous matrix consisting of the same phases (mean grain size 20 µm). Eucritic clasts are mainly characterized by clinopyroxene, with minor anorthitic plagioclase and orthopyroxene displaying very fine (1-2 µm width for NWA 10639 and 2-3 µm for NWA 10640) pigeonite exsolution lamellae. Minor phases include ilmenite, troilite, chromite, and, for NWA 10639, Fe-Ni metal. NWA 10639 displays a low weathering and a medium shock stage. NWA 10640 displays moderate degree of weathering and a medium shock stage.

EMPA analyses of selected grains were performed in order to determine the general minerochemical features of the matrix and of single crystals for classification purposes. Both samples display a calcic plagioclase (An_{90.1}Or_{0.9}, for NWA 10639 and An_{88.0}Or_{0.9} for NWA 10640), low-Ca pyroxene (Fs_{55.2}En_{42.4}Wo_{2.4}, Fe/Mn=37.6, and Fs_{56.1}En_{43.6}Wo_{2.3}, Fe/Mn=36.5, respectively), augite (Fs_{29.7}En_{30.6}Wo_{39.7}, Fe/Mn=32.8, and Fs_{39.2}En_{28.0}Wo_{32.9}, Fe/Mn=35.4, respectively), pigeonite exsolution lamellae in low-Ca pyroxene (Fs_{57.7}En_{33.8}Wo_{8.5}, Fe/Mn = 33.7 and (Fs_{59.4}En_{29.9}Wo_{10.7}, Fe/Mn = 34.2, respectively).

Oxygen isotope analyses performed on both samples provided the following results: δ¹⁷O = 1.87 ‰, δ¹⁸O = 4.01 ‰, Δ¹⁷O = -0.21 ‰ for NWA 10639 and δ¹⁷O = 1.82 ‰, δ¹⁸O = 3.89 ‰, Δ¹⁷O = -0.21 ‰ for NWA 10640.

Discussion and conclusions:

The textural and minerochemical data are distinctive and point to a classification as monomict eucrite [1,2]. Oxygen isotope data confirm this hypothesis [3].

References: [1] Bouvier, A. et al. (2016) *MAPS*, in press; [2] Grady M. et al. (2014), *Atlas of Meteorites*, 1st ed., CUP, Cambridge, pp.350; [3] Scott, E.R.D. et al. (2009), *GCA*, 73, 5835-5853.