Textural and minerochemical features of a new R3 chondrite, Northwest Africa 11263. V.Moggi Cecchi[1], G.Pratesi[2], S.Caporali[3,4], I.A.Franchi[5], R.C.Greenwood[5], [1]Museo di Storia Naturale, Università degli Studi di Firenze, Via G. La Pira 4, I-50121, Firenze, Italy, e-mail: vanni.moggicecchi@unifi.it; [2]Dipartimento di Scienze della Terra, Università degli Studi di Firenze, Via G. La Pira 4, I-50121, Firenze, Italy; [3]Consiglio Nazionale delle Ricerche, Istituto dei Sistemi Complessi, Via Madonna del Piano 10, 50019 Sesto Fiorentino (FI), Italy, [4]Dipartimento Ingegneria Industriale, Università degli Studi di Firenze, Via S. Marta 3, 50139 Firenze, Italy; [5]Planetary and Space Sciences, Open University, Walton Hall, Milton Keynes, MK7 6AA United Kingdom;

Introduction

Several small fragments of a new meteorite, weighing in total 281 g, were purchased in 2016 by Giorgio Tomelleri at the Erfoud Market from a Moroccan dealer (field label T2016-1). The outer surface of the fragments is covered by black fusion crust. The cut surface reveals a chondritic texture, with opaque phases and chondrules set in a silicate matrix. The meteorite has been submitted for classification and officially approved by the Nomenclature Committee of the Meteoritical Society under the name NWA 11263 [1]. The type specimen, weighing 20 g is on deposit at the Museo di Storia Naturale dell'Università di Firenze, together with a polished thin section, while the main mass is held by the owner.

Instruments and methods

BSE images and EMPA-WDS analyses were undertaken at the Firenze IGG – CNR laboratories with a Jeol microprobe. Oxygen isotope measurements were undertaken by laser-assisted fluorination at the Open University (Richard Greenwood and Ian Franchi).

Experimental results

Textural features

The thin section displays a texture consisting of separated, well-formed chondrules (ranging in diameter 0.3-0.9 mm) and chondrule fragments, set in a fine grained matrix.

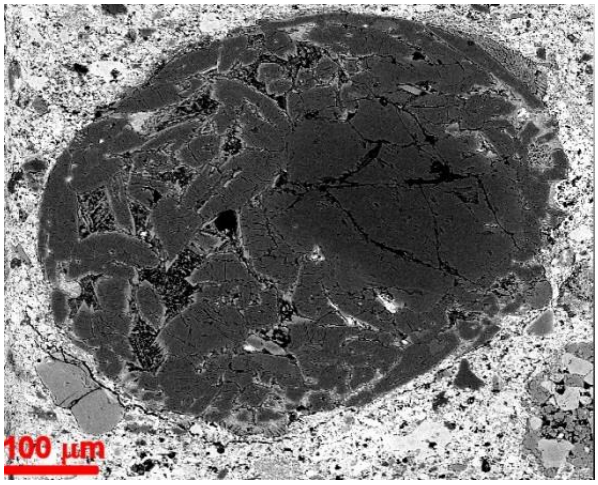

Figure 1: BSE image of pure-forsterite PO chondrule in NWA 11263; white areas are fine grained silicates and iron oxides; dark grey is forsterite; pale grey are Fe-rich olivine fragments;

Chondrules account for about 40 % of the section by area and are of various textural types. PO, PP and POP are the most common types, but skeletal BO chondrules can be also observed; a pure forsterite-rich PO chondrule, as well as an enstatite PP chondrule, are also present (Figures 1 and 2).

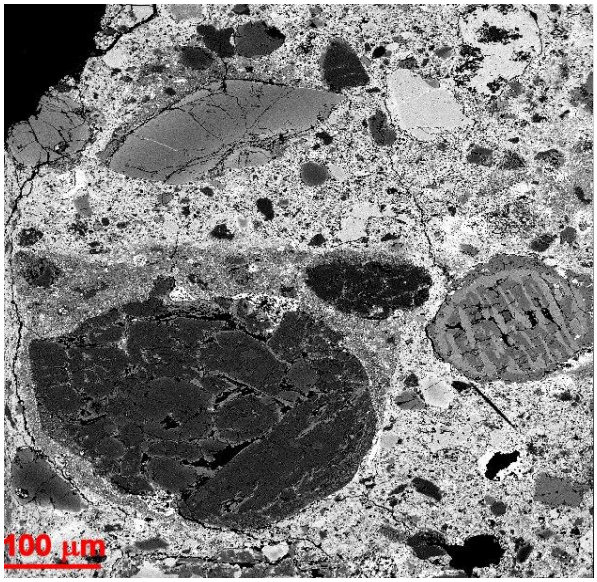

Figure 2: BSE image of a thin section of NWA 11263 displaying a PP and a skeletal BO chondrule; white areas are fine grained silicates and iron oxides; dark grey is clinopyroxene-rimmed enstatite; pale grey are olivine fragments.

Several chondrule and mineral fragments are visible, mainly consisting of Fe-rich homogeneous olivine. The matrix is fine grained and contains olivine, orthopyroxene, clinopyroxene and diffuse iron oxides. Silicate phases, both in the matrix and among fragments, are mainly represented by olivine, orthopyroxene and diopside. Among opaque phases, the most abundant is pentlandite, although Ti-bearing chromite can be occasionally found. Metal alloys are extremely rare. Framboidal aggregates of iron oxides are visible, probably due to weathering of previously existing sulphides (Figure 3). The thin section displays a moderate weathering and a low shock stage.

The meteorite appears unbrecciated in the thin section studied, and the poor matrix-chondrule integration suggests a petrologic type 3. Shock is moderately high (S3), while weathering is low (W2).

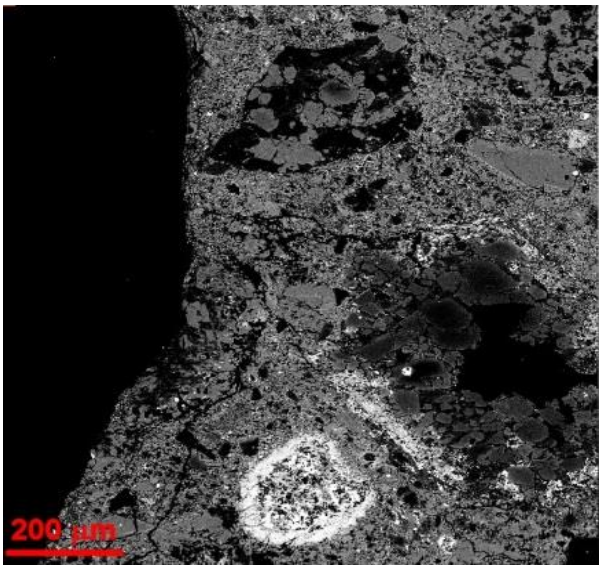

Figure 3: BSE image of an area of NWA 11263 displaying a framboidal iron oxide aggregate, some POP and PO chondrules and several chondrule fragments; pale grey areas are iron oxides;

Minerochemical features

EMPA analyses show that olivine is remarkably inhomogeneous and ranges from $Fa_{11.2}$ mol. % to $Fa_{41.4}$ mol. % (mean $Fa_{26.8}$), while low-Ca pyroxene displays a narrower compositional variation, ranging from $Fs_{7.0}$ mol. % to $Fs_{19.6}$ mol. % (mean $Fs_{13.3}$). EMPA-EDS analyses performed on the opaque phases confirmed the presence of pentlandite, Ni-rich pyrrhotite, metal and chromite. Oxygen isotope measurements provided the following results: $\delta^{17}O$ = 5.24 ‰, $\delta^{18}O$ = 5.99 ‰, $\Delta^{17}O$ = 2.12 ‰.

Discussion and conclusions:

Textural and minerochemical data suggest a classification as R3 chondrite, as confirmed by the comparison with other meteorites of this group [2,3,4,5]. Oxygen isotope data appear to confirm this hypothesis [6] (Figure 4).

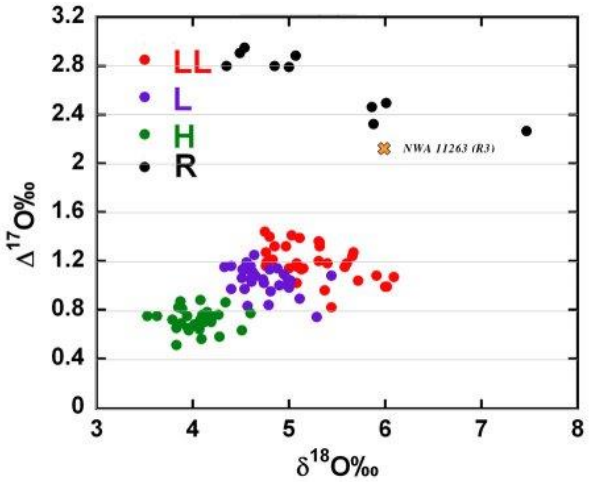

Figure 4: Oxygen isotope diagram displaying isotopic data for H, L LL ordinary chondrites and R chondrites;

References: [1] Bouvier, A. et al. (2017) MAPS, in press; [2] Grady M. et al. (2014), Atlas of Meteorites, 1st ed., CUP, Cambridge, pp.350; [3] Schulze H. et al. (1994); Meteoritics and Planetary Science, 29, 275-286; [5] Weisberg M.K. et al. (1991), Geochimica et Cosmochimica Acta, 55, 2657–2669; [6] Greenwood J. P., et al. (2000), Geochimica et Cosmochimica Acta, 64, 3897-3911;