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## NWA 4418: A new mesosiderite from Northwest Africa

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How to cite:

Pratesi, G.; Moggi-Cecchi, V.; Franchi, I. A. and Greenwood, R. C. (2009). NWA 4418: A new mesosiderite from Northwest Africa. In: 40th Lunar and Planetary Science Conference, 23-27 Mar 2009, Houston, Texas.

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Version: Accepted Manuscript

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**NWA 4418: A NEW MESOSIDERITE FROM NORTHWEST AFRICA.** G.Pratesi<sup>1</sup>, V.Moggi-Cecchi<sup>2</sup>, I.A.Franchi<sup>3</sup>, R.C.Greenwood<sup>3</sup>, <sup>1</sup>Dipartimento di Scienze della Terra dell'Università degli Studi di Firenze, Via G.La Pira 4, I-50123 Firenze, Italy, e-mail: [g.pratesi@unifi.it](mailto:g.pratesi@unifi.it), <sup>2</sup>Museo di Scienze Planetarie, Via Galcianese 20/h, I-59100 Prato, Italy, e-mail: [v.moggi@pratoricerche.it](mailto:v.moggi@pratoricerche.it), <sup>3</sup>Planetary and Space Sciences Research Institute, Open University, Walton Hall, Milton Keynes, GB-MK7 6AA United Kingdom

### Introduction

A single stone weighing 103,8 g was purchased in 2006 at the Erfoud market. The outer surface of the main mass is partially covered with a black fusion crust. A cut surface reveals a complex texture, with large metal areas set in a black, rocky matrix. Matteo Chinellato owns the main mass, while the type specimen, weighing 20,1 g, as well as a polished thin section [1] are on deposit at the Museum of Planetary Sciences (MSP) of Prato, Italy (inventory number MSP 5044).

### Instruments and methods

SEM images and EDS analyses have been performed at the MEMA center of the Earth Sciences Department of the University of Florence by means of a Zeiss EVO-MA15 SEM. EMPA-WDS analyses have been performed at the Padova laboratories of the IGG – CNR (National Council of Research) with a Cameca Camebax Microbeam microprobe. Oxygen isotope measurements have been performed at the Planetary and Space Sciences Research Institute Laboratories of the Open University by Richard Greenwood and Ian Franchi.

### Experimental results

The thin section of NWA 4418 shows a disomogeneous texture with large metal areas embedded in a silicate matrix (Figures 1 and 2). Metal accounts for 30 % of the total surface, with kamacite prevailing over taenite (Figure 3). Schreibersite is accessory. Silicate portion is formed by a microbreccia consisting of minute (not larger than ~ 40  $\mu\text{m}$ ) olivine, orthopyroxene and plagioclase grains and various clasts, mainly represented by orthopyroxene olivine (up to 200  $\mu\text{m}$ ) and plagioclase (up to 100  $\mu\text{m}$ ). Orthopyroxene clasts show very small (1  $\mu\text{m}$ ) exsolution lamellae (Figure 4), Clinopyroxene clasts are rather rare. Tiny oxide grains dispersed in the silicate matrix and probably deriving from altered metal or troilite can be occasionally observed (Figure 3 and 5). In the matrix orthopyroxene is prevailing over plagioclase thus indicating class B. Shock features are almost absent, suggesting a low shock stage. The sample displays minor oxidation of metal, pointing to a moderate weathering. Textural features like diffuse

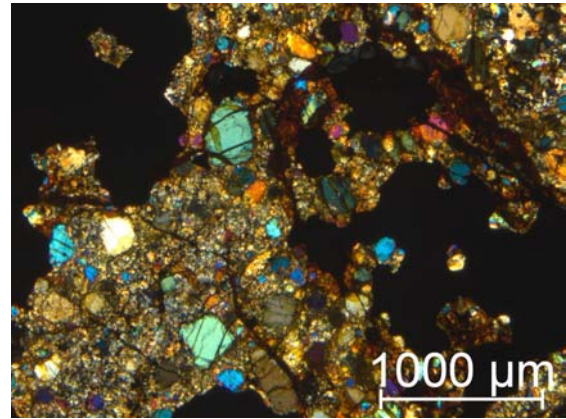


Figure 1: polarizing optical microscope image of a thin section of the mesosiderite NWA 4418 (sample MSP 5044); transmitted light, crossed polars.

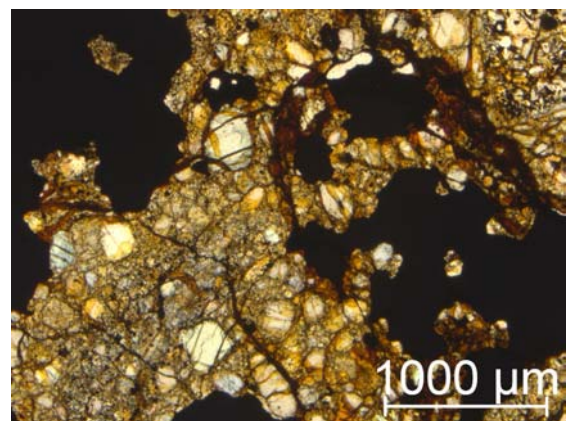


Figure 2: polarizing optical microscope image of a thin polished section of the martian meteorite NWA 4418 (sample MSP 5044); transmitted light, plane polars.

melting indicate that NWA 4418 may belong to subgroup 3 [2],[3].

SEM and EMPA analyses revealed that orthopyroxene is pigeonitic ( $\text{Fs}_{29,6}\text{En}_{67,3}\text{Wo}_{3,1}$ , with a FeO/MnO ratio ranging from 26.3 to 37.0). Clinopyroxene ( $\text{Fs}_{14,0}\text{En}_{43,9}\text{Wo}_{42,0}$ ) and exsolution lamellae ( $\text{Fs}_{21,6}\text{En}_{49,8}\text{Wo}_{28,6}$ ) are instead diopsidic; Plagioclase is anorthitic ( $\text{An}_{90,6}\text{Or}_{0,6}$ ). Oxygen isotope analyses (I.A.Franchi and R.C.Greenwood, *OU*) confirm textural and compositional data and are consistent with a classification as mesosiderite:  $\delta^{17}\text{O} = 2.145\text{‰}$ ,  $\delta^{18}\text{O} = 4.524\text{‰}$ ,  $\Delta^{17}\text{O} = -0.207\text{‰}$ .

### Discussion and conclusions

The set of data collected on this stony-iron meteorite point to a classification as mesosiderite. Oxygen isotope data plot in the mesosiderite field [4]. Textural and compositional data, as well as similarities with other mesosiderites from Northwest Africa point to a classification as subgroup 3B.

**References:** [1] Weisberg, M.K. et al. (2008) *MAPS*, **43**, 9, 1555; [2] Hewins R.H. (1984) *JGR*, **89**, C289-C297; [3] Powell B.N. (1971) *GCA*, **35**, 5-34; [4] Greenwood R.C., et al. (2006) *LPSC*, **37**, abs. 1768.

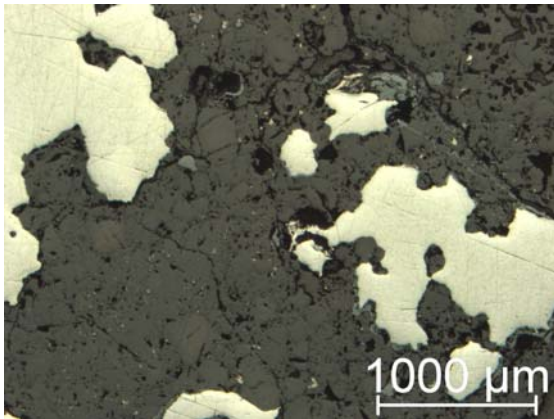


Figure 3: polarizing optical microscope image of a thin polished section of the martian meteorite NWA 4418 (sample MSP 5044); reflected light, plane polars.

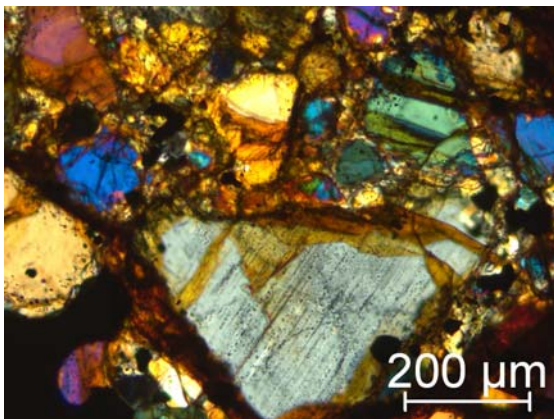


Figure 4: polarizing optical microscope image of a thin polished section of the mesosiderite NWA 4418 (sample MSP 5044). Detail of the silicate matrix with a large pyroxene crystal displaying exsolution lamellae; transmitted light, crossed polars.

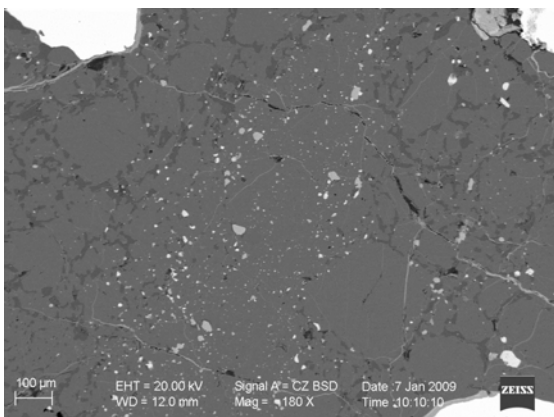


Figure 5: SEM-EDS image of a thin polished section of the mesosiderite NWA 4418 (sample MSP 5044). White areas are metal, tiny pale grey spots in the silicate matrix are iron oxides.