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Abstract:

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XRD, SEM and Petrologic Characterization of a L4-L5 Ordinary Chondrite Meteorite

T.M. Seixas[1,a], B. Almeida[2,b], M.H. Mendes[2,c], M.A. Salgueiro da Silva[1,d], J.F. Santos[2,e], F. Almeida[2,f], Z. Diogo[1,g], A.B. Lopes[3,h], J.M. Vieira[3,i]

[1]Departamento de Física e Astronomia da Faculdade de Ciências da Universidade do Porto, Rua de Campo Alegre 687, 4169-007 Porto, Portugal

[2]Departamento de Geociências/GEOBIOTEC, Universidade de Aveiro, Campus de Santiago, 3810-193 Aveiro, Portugal

[3]Departamento de Engenharia Cerâmica e do Vidro/CICECO, Universidade de Aveiro Campus de Santiago, 3810-193 Aveiro, Portugal

[a]tmseixas@fc.up.pt (corresponding author), [b]brunoalmeida@ua.pt, [c]mmendes@.ua.pt [d]masalsa@fc.up.pt, [e]fsantos@.ua.pt, [f]hernanibalmeida@.ua.pt, [g]saladiogo@gmail.com, [h]augusto@.ua.pt, [i]vieira@.ua.pt

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Abstract. In this work, a meteorite sample recovered in Morocco is characterized by detailed petrographic observations in transmitted and reflected light optical microscopy and by using XRD and SEM and it is tentatively classified. VIS/NIR spectral analysis of the same meteorite in a previous study suggested that it is seemingly related to the HAMLET meteorite, which was classified as LL4 chondrite. From the obtained results in the refinement of the analysis of the present study, this meteorite is classified as L4 to L5 chondrite. Composition maps across selected chondrules and in the matrix are presented.

1. Introduction

Meteorites are keys to understand chemical, mineralogical and physical properties of near-Earth and asteroid belt planetary bodies. Among them, chondrites are remnants of processes that occurred during the early stages of the solar system [1, 2]. Chondrites are composed of spherical particles set in a matrix and are interpreted as formed in a solar nebula and subsequently aggregated into planetary bodies [3]. Starting at accretion itself, secondary processes such as shock and thermal metamorphism and aqueous alteration may modify the primary chondritic components [4]. They can preserve information of the parent bodies from which they are derived and record the evolutionary processes. Mineralogy, texture and chemical composition of meteorites are essential for their classification and became important tools to follow planet formation processes as well as the evolution of the solar nebula and in the interpretation of asteroid remote-observation spectra [5]. The meteorite of this study, recovered in Morocco, was previously classified [6] as a *stony-iron and* its VIS/NIR reflectance spectrum was correlated with spectra (over 14700, in 2008) of meteorites catalogued in the publically available RELAB spectral database [7] as being close to the Hamlet meteorite, which is described as LL4 ordinary chondrite [8].

This work presents results of textural and mineralogical characterization of the same meteorite fragment by means of coordinated studies of optical microscopy, X-Ray diffraction (XRD), scanning electron microscopy (SEM) using energy dispersion spectroscopy (EDS) in semi quantitative mineral analysis and multi elementary mapping. In this work we pursued with a thorough and more detailed investigation of this meteorite in order to clarify its classification.

2. Experimental methods

Parallel slabs were cut from the meteorite fragment (4 cm long, approximately 8 cm^2 area) and prepared by mounting in epoxy resin. One thin section with 0.03mm thickness and two thick sections were ground and polished to 1 μm finish for optical microscopy in both transmitted and

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Authors:	Teresa M. Seixas (/author-papers/teresa-m-seixas), Bruno Al (/author-papers/bruno-almeida), Maria H. Mendes (/author-

papers/maria-h-mendes), Manuel A. Salgueiro da Silva (/author-papers/manuel-a-salgueiro-da-silva), José F. Santos (/author-papers/josé-f-santos), Fernando Almeida (/author-papers/fernando-almeida), Zenaida Diogo (/author-papers/zenaida-diogo), Augusto B. Lopes (/author-papers/augusto-b-lopes), Joaquim M. Vieira (/author-papers/joaquim-m-vieira-1)

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