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SIMS STUDY OF AN UNKNOWN SILICATE PHASE FROM THE PATOS DE MINAS IIA IRON

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Introduction: Patos de Minas is a normal hexahedrite that contains a few angular nodules of troilite with daubreelite exsolution lamellae [1–2]. Here we report on a chemical study of the first silicate phase observed in this meteorite.

Results: The polished section of Patos de Minas from the Museu Nacional da UFRJ, Brazil contains a perfectly round silicate inclusion within an almost perfectly round sulfide inclusion imbedded in the metal. The sulfide is decorated by a thin rim of metallic-looking phases [3]. It consists of two phases: Cr-bearing troilite (Fe: 58.5; Cr: 1.8; S: 39.4 wt%) and daubreelite (Fe: 18.5; Cr: 30.7; S: 48.4 wt%), each occupying half of it. Bars of troilite are present in the daubreelite and vice-versa. The spherical silicate inclusion (400 μm in diameter) is surrounded by both sulfides, is isotropic, indicating a glass, and has a major element composition that varies widely from: SiO₂: 38.3–73, FeO: 1.7–47.4, CaO: 0.04–17, Na₂O: 3.7–0.03 wt%. The low totals of the analyses (80–93 wt%) could be indicative of an alteration by (partial) hydration of an unknown precursor phase. The whole object (silicate and sulfides) is thinly enveloped (~100–200 μm) by cohenite (Fe: 90, Ni: 1.6 wt%) and schreibersite (Fe: 53.6; Ni: 30.6; P: 15 wt%).

Trace element abundances in the Fe-rich silicate phase (FeO: 33.6–47.4 wt%) as determined by SIMS show a peculiar pattern, with the heavy REEs (~0.6 × CI abundances) depleted with respect to the light REEs (~6 × CI). This REE pattern, with a weak Tm+ and a strong Eu+ anomaly, is reminiscent of the group II CAI REE abundance pattern. It is a strong indication that the silicate (or its precursor) has formed from a vapor, which was depleted in the super-refractory elements.

The Nb abundance is extremely high (~300 × CI), and abundances of moderately volatile and volatile elements are also high (5–20 × CI). The very high Nb content suggests that the silicate had a sulfide precursor, which was subsequently oxidized. Metasomatic processes probably added the moderately volatile and volatile elements from a reservoir with chondritic relative abundances as indicated by the Fe/Mn ratio. The missing volatile phase, possibly (OH), could be terrestrial. However, the trace element abundances do not show any terrestrial contamination. Further studies are needed.

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References: [1] Buchwald. 1975. *Handbook of Iron Meteorites*, Univ. of California, 965 p. [2] Kracher et al. 1980. *Geochimica et Cosmochimica Acta* 44:773–787. [3] Zucolotto et al. 2006. V Encontro da SBPMat.

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STEPPED COMBUSTION TECHNIQUE FOR MEASUREMENT OF SOLAR WIND N ISOTOPIC COMPOSITION IN GENESIS TARGETS

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Introduction: Measurement of N isotopic composition in the Genesis samples has turned out to be a tricky business. The results obtained so far in two laboratories [1, 2] are different by 700‰ (from –400 to +300‰)! The laboratories used different extraction methods and target materials: amalgamation of gold on sapphire [2] and UV laser ablation of gold plated stainless steel [1]. Both techniques are proven to be efficient enough and have been checked using artificially implanted target samples. However the dramatic discrepancy between the results clearly suggests that there is something wrong with one of the two, or perhaps both measurements. And though no obvious mistakes in the measurements have been found yet, both of them are suffered from some problems. In the case of laser extraction the main problem is with a high level (90% and more) of contamination of the gold layer with terrestrial N. Therefore, the SW δ¹⁵N value has been obtained in this case by a very long extrapolation. In the case of amalgamation a potential problem is underestimating of the CO contribution at masses 28 and 29.

We have developed an alternative technique for analysis of SW N which supposes stepped oxidation of the diamond-like-carbon (DLC) on Si (DoS) Genesis targets. For the measurements we use our Finesse machine – a complex of three mass spectrometers all working in static mode and fed from a single extraction line. The machine allows to make measurements of C, N and some noble gases (in the case of the Genesis sample –Ne) simultaneously. C is used to monitor the thickness of the carbon layer oxidised and Ne to monitor the SW fluence.

N Yield: In order to provide a high yield of N, Si is first dissolved in hot KOH and oxidation of the residual DLC film is performed at high (1100°C) temperature. For the first step at 1100 °C no oxygen is used – and removes the bulk of the surface contamination. The following steps at 1150, 1200, and 1300 °C are made with variable oxygen pressure in order to remove the first 20 nm layer (at 1150 °C) and extract gases only from the 20 to 70 nm layer, where most of the SW N is located (at 1200 °C). This way of oxidising the DLC film provides the lowest possible contamination of the SW N with laboratory organic N. This experimental protocol has been developed by using ¹⁵N implanted samples and provides SW N yield not less than 80%.

Banks and Contamination: The extraction blank (without any sample) of the mass spectrometric system is typically 0.1 ng or lower. The most important source of N contamination is surface contamination by organic compounds/particles, present on both the Pt foil and DLC films. Its level is variable (3–10 ng), but it is possible to get rid of almost all of this surface contamination before the main SW N component starts to release. Thus, 1 cm² of concentrator DoS target with ~1 ng of SW N can be analysed with less than 50% of the measured signal from contamination. The isotope ratio of ~1 ng of N can be measured with a precision of ~± 5%. We hope to present first results for the flight samples on the conference.

References: [1] B. Marty et al. 2009. LPSC XL, abstr. #1857; [2] R. Pepin et al. *ibid.*, abstr. #2103.