NANOSIMS ELEMENT MAPPING OF ACFER 094

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Introduction: Acfer 094 is a type 3.0 ungrouped carbonaceous chondrite with affinities to CO and CM type chondrites. It has a fine-grained matrix composed of Fe,Ni sulphides, low-Ca-pyroxenes, forsteritic olivines and amorphous material [1]. Matrix plots with elements in order of increasing volatility suggest Acfer094 is compositionally closer to CM than CO [2]. Although a primitive specimen, Acfer 094 shows evidence of terrestrial weathering [3] Given the extreme fine grain-size of matrix components, in the current work we have used NanoSIMS for element mapping (data acquired at The Centre for Microscopy, Characterisation and Analysis (CMCA) at the UWA).

Method: A thin section of Acfer 094 was gold coated (6nm) and nine 30µm x 30µm areas were sputtered for element mapping in a Cameca NanoSIMS 50 ion microprobe. A Cesium (Cs+) ion source with a resolution of 50nm and an Oxygen (O-) ion source with a resolution of 200nm were used to analyse both electronegative (H-, C-, O-, N-, F-, Cl-, P-, Te-, Ni- & S-) and electropositive (Mg+, Al+, Si+, Ca+, Fe+, Co+ & Ni+) elements.

Results: Over fifty individual element maps were arithmetically combined using ImageJ software highlighting a series of matrix features on a micron and sub-micron scale: Ni-veins, Ni-rings, S-inclusions, µCAIs, Cr, Ni & Ti hotspots, as well as surface contaminants, rust veins & other weathering features.

Discussion: Among many unusual features observed during the course of this analysis, one interesting result was the identification of two isolated areas showing sub-µm sulphide inclusions (Figure 1), embedded in a silicate background material, which incorporates minor FeO and Ni. Similar features - described as metal/sulphide-silicate shock-melt in CBs QUE94411 and HAH237 - were found interstitial between silicate and metal [4]. However the inclusions in Acfer are significantly smaller and sulphide is more angular. Their origin, and additional sub-µm matrix features revealed by this technique, will be discussed at the conference.

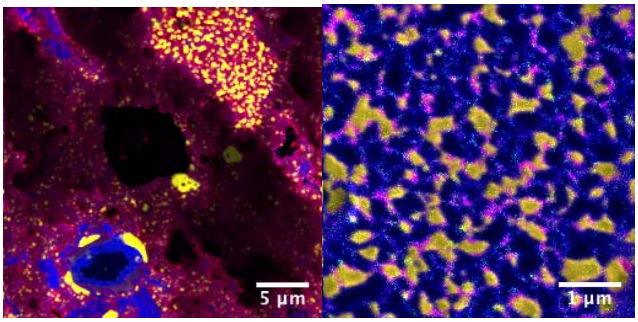

Figure 1: *Left*: O=blue, S=yellow, Si=red. *Right*: Close-up of S inclusion; O=blue, S=yellow, Ni=green & FeO=red

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