LA-ICP-MS STUDY OF IIIAB IRONS & PALLASITES: HSE BEHAVIOUR DURING MAGMATIC FRACTIONATION.

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Introduction: The IIIAB iron meteorite group and Main Group Pallasites are believed to be magmatically linked, although the exact crystallization history may be complex [e.g. 1]. Here we report spatially resolved concentrations of these elements in FeNi-metal (kamacite & taenite) from a suite of IIIAB irons (Henbury, Wabar, Grant and Mt. Edith) and in the Brenham Main Group Pallasite, with the aim of uncovering the relationships between them.

Experimental: LA-ICP-MS analyses employed a quintupled Nd:YAG laser delivering a 213nm UV beam (1.0±0.2 mJ beam energy, 10 Hz ablation rate and 80-120 μm spot sizes) coupled to an Agilent 7500a ICP-MS, which was operated in dual detector (pulse and analogue) mode, allowing Ni to be used as a major element internal standard. Internal Ni concentrations were determined using a CAMECA SX-50 EMP. Effect of matrix differences between standard and analyte signals were negligible [2].

Results: IIIAB irons exhibit extreme variation in HSE content. Two groups are evident: (1) Henbury and Wabar: high PGE_{tot} coupled with depletion in Pt, Ru, Rh, Pd and Au relative to Re, Os and Ir and (2) Mt. Edith, Grant & Brenham: low PGE_{tot}, low Re, Os and Ir concentrations and high Pt, Ru, Rh, Pd and Au contents.

Discussion: HSE systematics are driven by (1) magmatic fractionation and (2) sub-solidus partitioning between FeNi-metal phases. We concentrate on magmatic fractionation here. Re and Os are highly compatible, while Ru, Pt and Pd behave increasingly incompatibly [3]. Thus, Henbury & Wabar crystallized early, whereas Grant & Mt. Edith crystallized later, from an already depleted melt. A strong genetic link between IIIABs and pallasites is supported by (1) similarity in HSE content and (2) very systematic compatible-incompatible element behaviour. However, a simple fractional crystallization model cannot account fully for the trace element systematics in IIIAB irons [e.g. 4,5]. HSE data suggest that Brenham derives from an extensively fractionated source, as previously suggested [6]. Mt. Edith FeNi-metal derived from a source even more fractionated than that of Brenham, i.e. after excess of 80% crystallization [6]. Thus, the source from which Brenham FeNi-metal crystallized continued to either temporally or spatially evolve. Inclusions of olivine in Brenham does not appear to affect the magmatic HSE systematics. Variations in Re/Os and Ir/Os between Mount Edith and Grant indicate that the conditions experienced during late evolution of these two fractions may have been different.

Calculated solid metal/liquid metal partition coefficients are as follows (elements placed in order of increasing compatibility): Au & Pd are less than 1, Rh is close to 1, Ru & Pt fall between 2 and 10, and Re, Os and Ir are in excess of 300.

References: [1] Mittlefehldt et al. 1998, In: Planetary Materials, Papike J.J. (Ed), p.195. [2] Mullane et al. 2003 Chem. Geol. *submitted*. [3] Humayun & Campbell, 2000, *LPSC XXXI,* No.2032. [4] Ulff-Moller, 1998, *LPSC XXIX,* No.1969. [5] Chabot & Drake, 1999, *Met. Plan. Sci.,* 34; 235. [6] Scott 1977, *Min. Mag.,* 41:265.