PRECIOUS METAL ABUNDANCES IN SELECTED IRON METEORITES: *IN-SITU* AMS MEASUREMENTS OF THE SIX PLATINUM-GROUP ELEMENTS PLUS GOLD

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The metal phases of the coarser iron and stony-iron meteorites are well-suited to *in-situ*, single-crystal analysis by AMS. In contrast, the fine-grained Ni-Fe alloys of the Ni-rich ataxite (type IV) irons appear as micron-scale eutectoid intergrowths, broadly reminiscent of the quenched groundmass of NiS fire-assay beads, and in these samples AMS can only provide a mean analysis of many thousands of crystallites (nevertheless a small sample population relative to 100 to 1000-mg bulk analyses, which are several orders of magnitude larger still). The scale of sampling is especially relevant to *in-situ* ratio measurements of stable isotopes (Ding 1996; *see also* Ding *et al.*, this conference). The elevated levels of PGE and Au in bulk samples of iron meteorites render detection of these 7 precious metals very straightforward, despite the widely variable sensitivity of AMS to each element (Wilson *et al.* 1995). Detection is harder for Ag (very low abundance) and Re (very low negative ion yield). Six irons of types I, II, III and IV were studied at length: Cañon Diablo, Negrillos, Welland, Manitouwabing, Weaver Mountains and Hoba. A detailed treatment of the results is available (Wilson *et al.* 1993).

AMS data on plessite (fine-grained material in the IVs), kamacite and taenite suggest a variation in overall precious-metal abundances of a factor of 16 between the most-enriched iron (Negrillos, ΣPGE+Au = 270 ppm) and the least-enriched (Welland, 16–19 ppm). The use of chondrite-normalized PGE patterns is common in terrestrial petrogenetic and Ni-Cu-PGE mineral deposit studies. They are seldom used for classification of iron meteorites because of wide variations in pattern within certain classes. Yet the PGE "fingerprint" may still be valuable for well-constrained problems. The use of PGE patterns for a provenance study ("pairing", in this case) of meteoritic iron masses is presented for Welland (IIIA), an 1888 find from southern Ontario. Few published data are available for Welland: comparison of a type sample with a smaller piece of unknown metal, with respect to PGE pattern, major-element chemistry (electron microprobe data) and texture, indicate strongly that the latter is a fragment of the same iron.

REFERENCES

Ding, G.-J. 1996 (ms.) In situ analysis of ^{187}Re-^{187}Os systematics and silver isotopic compositions in iron meteorites using accelerator mass spectrometry. Ph.D. thesis, IsoTrace Laboratory, University of Toronto.

Wilson, G. C., Rucklidge, J. C., Kilius, L.R., Ding, G.-J. and Cresswell, R. G. 1993 Precious metal abundances and silver isotope ratios in selected iron meteorites. 1. Abundances of PGE and gold in the kamacite and plessite of iron meteorites. 2. Prospects for in-situ silver isotope measurements in iron meteorites by accelerator mass spectrometry. IsoTrace Laboratory Report, University of Toronto, 33+10 p.

Wilson, G. C., Rucklidge, J. C. and Kilius, L.R. 1995 Ultrasensitive trace-element analysis with accelerator mass spectrometry: The current state of the art. *Canadian Mineralogist* 33: 237–242.

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