IN SITU ANALYSIS OF PLATINUM GROUP ELEMENTS IN ORDINARY CHONDRITE KAMACITE

C. M. Gilmour and C. D. K. Herd. Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB T6G 2E3, CA. E-mail: cgilmour@ualberta.ca.

Introduction: Due to their siderophile nature platinum group elements (PGEs) are abundantly found in extraterrestrial Fe-Ni metal. Besides their utility in investigating core formation processes [1] and identifying projectile compositions in impact craters [1, 2], PGEs are of interest for economic development of asteroids due to their relative scarcity on Earth making them potentially very valuable in the terrestrial market [3].

Concentrations of PGEs in ordinary chondrite metal vary between the groups and can even vary within an individual chondrite [4]. LL chondrite total metal is more enriched in PGEs than H chondrite metal [5]. The variation of PGEs among ordinary chondrites may be explained by conditions of formation and/or secondary metamorphic processes [e.g., 4, 6]. This study aims to understand the variability of PGEs in ordinary chondrites via *in situ* analysis. Here we report results from kamacite grains in ordinary chondrites of varying group and petrologic type.

Methods and Results: PGE and Ni concentrations in kamacite were measured using LA-ICP-MS and electron microprobe, respectively. A representative suite of ordinary chondrites was chosen which included one H4 (Buzzard Coulee), one H5 (Richardton), two H6 (Estacado and Kernouve), three L4 (Bjurböle, Dalgety Downs, and NWA 6204), one L5 (Knyahinya), two L6 (Bruderheim and Peace River), and one LL6 (Benares (a)).

Results for Ni, Pt, Ir, and Os are shown in Table 1.

Type	Ni (wt.%)	Pt (ppm)	Ir (ppm)	Os (ppm)
H4	6.8(1)	2.7(3)	1.3(1)	1.4(2)
H5	6.5(5)	3.5(8)	1.9(6)	2.0(7)
H6	6.3(3)	5.1(4)	2.6(3)	2.9(4)
L4	6.3(9)	5(2)	2(1)	3(1)
L5	6.7(3)	5(3)	3(2)	3(2)
L6	6.2(9)	8(5)	4(2)	4(2)
LL6	6.3(3)	5(1)	2.3(9)	2.6(9)

Table 1. Siderophile element concentrations in kamacite in ordinary chondrites from this study, averaged by group and type. Standard deviations of the mean are provided in parentheses.

Discussion: In situ results confirm the variability between different ordinary chondrites. However, results within each group and within each type generally agree within uncertainties. The H chondrites show a systematic increase in PGE concentration from type 4 to type 6; a similar trend for L chondrites remains to be tested. The low values for the LL chondrite kamacite relative to high values for LL metal (e.g., up to 25 ppm Pt; [5]) suggest preferential partitioning of PGEs into taenite, consistent with previous results [7].

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