An ion microprobe study of siderophile elements in metal grains in the Y81020 (CO 3.05) chondrite

H. HIYAGON[1], Y. MORISHITA[2,3] AND G. SAITO[3]

[1]Deptment of Earth and Planetary Science, The University of Tokyo, Tokyo 113-0033, Japan.
[2]Faculty of Science, Shizuoka University, Shizuoka 422-8529, Japan.
[3]AIST, Ibaraki 305-8560, Japan,

In order to understand the fractionation processes of siderophile elements (accroding to their volatility) in the solar nebula, we have conducted an ion microprobe analysis of siderophile elemnets in metallic grains in a primitive condrite Y81020 (CO 3.05).

We have prepared several metallic arroys as standards for the analysis. Each alloy contains ~95 wt.% Fe and 2-5 siderophile elements with concentrations of ~1 wt.%. Using the standards, we have determined relative sensitivity factors (RSFs) for the analysis using ims-1270 (@AIST, Japan). In the present study, we analyzed Fe, Ni, Co, Pt, Ir and Au. We used a Cs^+ primary beam of ~40 μm in diameter and analyzed negative ions from a central ~6 μm x 6 μm area of the beam. An electron gun was used for charge compensation. The obtained RSF, defined by $(M^-/Fe^-)_{SIMS}/(M/Fe)_{true}$, varies greatly from 22 (Co) to 47600 (Au).

So far, we have analyzed one isolated metal grain of ~100 μm in size and three metal grains (10-20 μm in size) in two chondrules, where metal grians are completely surrounded by olivine. The isolated large metal grain shows negligible amount of Pt and Ir, low Au (0.12 x solar), and slightly low Ni (~0.6 x solar). On the other hand, metal grains in chondrules show variable Pt and Ir (0.02-1.0 x solar for Pt and 0.05 to 1.3 x solar for Ir), and low Au (0.11-0.33 x solar). The present results, showing large variation in the abundances of refractory PGEs (Pt and Ir), are consistent with the results by [1]. At present, we speculate that the carriers of refractory PGEs (small ultrarefractory metal grains) might be rather heterogeneously distributed in the source materials of chondrules. Further studies are required for better understanding of the fractionation processes of the siderophile elements.

[1] Connolly et al. (2001) GCA 65, 4567-4588.