IN-SITU CHEMICAL ANALYSES OF WINONAITE METALS: IMPLICATIONS FOR THE ORIGIN OF IAB NON-MAGMATIC IRON METEORITES.

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Introduction: Winonaites are primitive achondrites that are defined as the partial melting residues of asteroids and might share the same parent body with IAB irons [1]. IAB irons have several subgroups according to its Au and Ni abundances [2]. However, the relationship among each subgroup and their evolution processes are not well understood [2, 3]. Recently, it was suggested that there were at least 3 or 4 parent bodies for IAB irons on the basis of their Mo isotopic abundances [4]. Since the chemical diversity among winonaite metals is supposed to be the result of early stages of metal partial melting, we will try to understand the chemical evolution of metals in the IAB-winonaite parent body by model calculation of metal partial melting. In this study, we performed *in-situ* chemical analyses of metal grains in winonaites and found genetic relationships between winonaites and IAB irons, and among IAB iron subgroups.

Results & Discussion: We have analysed thick sections of winonaites Y-8005,51-4 and A 10077,51-1 by an laser ablation inductively coupled mass spectrometry (LA-ICP-MS) at National Institute of Polar Research, Tokyo (NIPR). The Ni- and CI-normalized chemical compositions are shown in Fig. 1. Y-8005 metals have nearly chondritic composition. On the other hand, highly siderophile elements, W, Ge and Ga abundances of A 10077 metals are severely depleted (~0.1 in $(X/Ni)_{CI}$). These results indicate that Y-8005 metals retain chemical compositions of their precursor materials and A 10077 metals are originated from metallic melt. Based on a Ge/Ni-Au/Ni diagram, Y-8005 metal compositions are consistent with those of IAB-sLL (subgroup low-Au, low-Ni) [2], while A 10077 metal compositions are similar to those of IAB-sLM (subgroup low-Au, medium-Ni) [2]. When Y-8005 metals and IAB-sLL metals are considered to be the starting material, the chemical compositional difference between Y-8005 metal (IAB-sLL) and A 10077 metal (IAB-sLM) could be explained by metallic partial melting model calculation [5-7]. In this calculation, A 10077 metal and IAB-sLM are indicated as partial melt liquid, and IAB-MG (main group) is indicated as partial melt residue. However, volatile siderophile element (like Ge and Ga) compositions of A 10077 and IAB-sLM show severe depletion relative to model calculated partial melt liquid. We thus suggest that there was evaporative loss of these volatile siderophile elements at the timing of melting or during cooling of parent metallic liquid. The presence of evaporative loss strongly suggests that a shallow metallic melt pool was the origin of IAB-sLM.

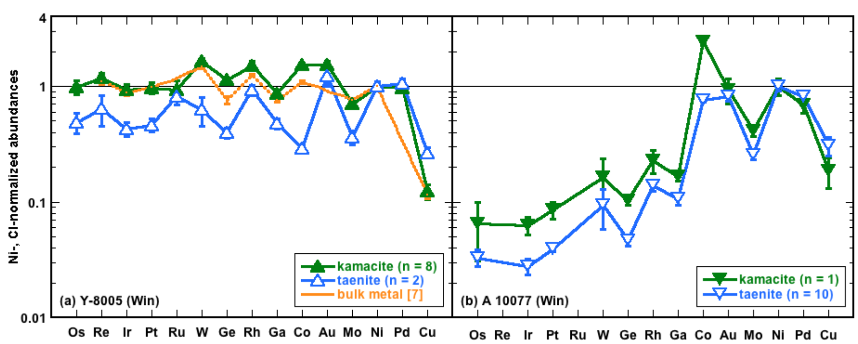

Fig. 1. Ni- and CI-normalized chemical compositions of winonaite metals. Bulk metal data of Y-8005 are from [7]. CI chondrite data used for normalization is from [8]. The order of elements is according to solid-metal/liquid-metal partition coefficients in Fe-Ni-S eutectic composition.

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