PETROGRAPHIC STUDY OF WEIYUAN AND DONG UJIMQIN QI MESOSIDERITES.

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Introduction: The Weiyuan meteorite was found in Gansu, China, in 1978. The Dong Ujimqin Qi meteorite fell in 1995, and three fragments with a total mass of 128.8 kg were recovered soon after the fall. However, only few studies of both meteorites have been reported. Mineralogical and chemical composition and cosmic-ray exposure (CRE) ages of Weiyuan and Dong Ujimqin Qi were measured by [1]. Platinum group elements (PGE) of metal grains from Dong Ujimqin Qi were analyzed with INAA, and REE of olivine grains from the same meteorite were analyzed by ICP-MS [2]. Although the mineral chemistry of silicates from both mesosiderites are similar, Dong Ujimqin Qi has a much older exposure age (252 Ma) than that of Weijuan (25.9 Ma) [1]. In Dong Ujimqin Qi, PGEs of metal suggest fractional crystallization of molten metal, while REE of olivine clasts indicates a different asteroid origin from the parent body of the mesosiderite silicates [2].

Results: Our mineralogical study of Weiyuan and Dong Ujimqin Qi reveals significant differences, suggestive of distinct magma sources and different thermal histories. Kamacite and taenite in both meteorites show a negative correlation between Ni and Co, and systematically higher Co contents in Dong Ujimqin Qi than Weiyuan. Furthermore, kamacite grains in metallic clasts in both meteorites have rather homogeneous Ni contents, indicative of equilibrium during slow cooling. This is confirmed by the "M" type zoning of taenite and significant Ni decreasing in the adjacent kamacite in Dong Ujimqin Qi. In contrast, metal inclusions in silicates in both meteorites exhibit wide and continuous Ni contents. This discovery suggests different origins of the metal inclusions and clasts. On the other hand, some kamacite inclusions in low-Ca pyroxene in Weiyuan are Ni-poor (2.42-3.80 wt%), probably formed via reduction of FeO, which suggests a decrease of oxygen fugacity. However, low-Ca pyroxene in Dong Ujimqin Qi shows an increasing trend of FeO content from the core to the rims, indicative of a more oxidizing condition. Schreibersite grains in Dong Ujimqin Qi are zoned, with homogeneous and Ni-rich cores and heterogeneous and Ni-poor rims. The Ni-poor rims of schreibersite could be formed by heating followed by fast cooling, probably which would be an impact event.

Merrillite, stanfieldite and cordierite were found in Dong Ujimqin Qi and they all have homogeneous compositions, confirming previous study [2]. Merrilite in Weiyuan contains less FeO (0.3-0.6 wt%) and higher Na_2O (1.0-1.1 wt%) than in Dong Ujimqin Qi. Low-Ca pyroxene is homogeneous and FeO-rich in Weiyuan (av. $Fs_{32.6}$), whereas highly zoned from Fs_{22} to Fs_{44} in Dong Ujimqin Qi. Plagioclase is An-richer in Weiyuan (An_{93}) than Dong Ujimqin Qi (An_{88}). Silica contains less Al_2O_3 in Weiyuan (0.35 wt%) than in Dong Ujimqin Qi (0.56 wt%).

Conclusions: The different petrographic and mineral chemical features of Weiyuan and Dong Ujimqin Qi suggest their different magma resources and experienced distinct thermal histories.

References: [1] Terribilini D., et al. 2000. *Meteoritics & Planetary Science* 35: 617-628. [2] Kong P., et al. 2008. *Meteoritics & Planetary Science* 43: 451-460.