Hf-W chronology of the Brenham pallasite

*Yoshitaka Homma[1], Tsuyoshi Iizuka[1]

1. Department of Earth and Planetary Science, The University of Tokyo

Pallasites are stony-iron meteorites consisting mainly of olivine and FeNi metal. Some relations with iron meteorites are pointed out for pallasites, implying that pallasites represent the core-mantle boundaries of their parent bodies. Therefore, pallasites potentially provide a unique opportunity to study core formation and core-mantle interaction on planetesimals. Further, chronological investigations of pallasites make it possible to decide the timescales of differentiation and crystallization of the planetesimals. In this study, the Hf-W chronology was applied to the Brenham main group pallasite. We evaluate the nucleosynthetic and neutron capture effects by combined W and Pt isotopic analysis. The metal fractions yielded ε^{182}W values of -3.43 ±0.15 and -3.85 ±0.21 relative to the standard solution. The obtained $\varepsilon^{183/184}$W values were in agreement with the standard solution, indicating that there is no nucleosynthetic anomaly in Brenham. The Pt isotope measurement was carried out on one of the two metal fractions analyzed for W isotopes. The positive anomaly in $\varepsilon^{196/195}$Pt represents the neutron capture effect on the Brenham metal. For correction of the neutron capture effect, we apply the reported correlation slope for iron meteorites (Kruijer et al., 2014). The corrected $\varepsilon^{182/184}$W value of -3.26 ±0.29 corresponds to the model age of 2.0 ± 2.9 Myrs after the CAI formation, which is consistent with the olivine Al-Mg age of 1.24 +0.40/-0.28 Myrs and the Mn-Cr age of ~2.5 –4 Myrs after the CAI formation (Baker et al., 2012; McKibbin et al., 2016). The gained Hf-W model age is also consistent with the early accretion of magmatic iron meteorites and apparently older than the non-magnetic iron meteorites, indicating that the Brenham metal formed during the early metal segregation on its parent body (Kruijer et al., 2013; Markowski et al., 2006).

Keywords: Hf-W chronology, pallasite meteorites, core-mantle segregation

