

Multiple sulfur isotopic composition of mesosiderite meteorites: Implication for formation processes

*Shun Mihira¹, Akira Yamaguchi², Madhusoodhan Satish-Kumar¹

1. Niigata University, 2. National Institute of Polar Research

Mesosiderites and HED (howardite, eucrite, diogenite) meteorites are considered to have a common origin, from the asteroid Vesta. However, the information on processes that led to the origin of mesosiderites and their relation with HED's are not clear yet. In this respect, multiple sulfur isotopic composition may track their petrological relationships and suggest genetic links of mesosiderites with other meteorites. In this study, multiple sulfur isotopic compositions of two mesosiderites (Asuka-882023, Asuka-880154) and one diogenite (Yamato-74013) were obtained. The $d^{34}\text{S}$ and $D^{34}\text{S}$ relationships of the mesosiderites indicate that they do not match with those of HED meteorites reported in Rai et al. (2005), however, they have some similarities with main group pallasites, a group of stony-iron meteorites (Dottin et al., 2018). This suggests that the variations in sulfur isotopic compositions in mesosiderites might have resulted from metal-silicate fractionation and mixing process and not related to their predecessor. According to Clayton et al. (1996), the $D^{17}\text{O}$ value suggested the genetic links with pallasites, IIIAB iron meteorites, and HED. In this study, the values of sulfur isotopes of mesosiderites indicate similar value with IIIAB iron meteorites and pallasites but not similar to HED. This result suggests that the sulfur isotopic composition does not track their parent body but may relate to metal-silicate reaction. The formation process of mesosiderites is explained by hit-and-run model (Haba et al. 2019). In this study, comparing $D^{33}\text{S}$ value of mesosiderites and HED. Mesosiderites and diogenites had experienced similar environment of formation. Also, including to consider about offset of the value of stony-iron meteorites by their metal phase and silicate phase, the material of mesosiderite can be diogenitic silicate and origin of I C, II AB, III AB, and IVA iron meteorites or howarditic silicate and origin of IAB or IVB iron meteorites.

Keywords: Mesosiderites, Sulfur isotopes, Meteorite