

The Hachioji meteorite: Petrological and noble gas study and classification

*Akira Yamaguchi^{1,5}, Shigekazu Yoneda², Ryuji Okazaki³, Naoya Imae^{1,5}, Makoto Kimura¹, Ryuho Kataoka^{1,5}, Kiyomi Iwahashi⁴, Toru Mori⁶, Mutsumi Komatsu⁵

1. National Institute of Polar Research, 2. National Museum of Nature and Science, 3. Kyushu University, 4. National Institute of Japanese Literature, 5. SOKENDAI (the Graduate University for Advanced Studies), 6. Konica Minolta Science Dome (Hachioji Children's Museum of Science)

The Hachioji meteorite fell in 29 December 1817 as a shower including ~1 m stones covering an area over 10 km in the western Tokyo. Although part of the recovered meteorites were sent to the Tokugawa Shogunate, all the stones had been lost to date. In 1950th, ~0.1 gram chip of the meteorite was found in classical documents (envelope) from "Tuchimikado". The chip was enclosed by a document on the Hachioji recovery. In the same envelope a paper describing about the Sone meteorite, fell in Kyoto in 1866, was included. Thus, a question arises whether the small chip was part of Hachioji. Since it was difficult to examine the small chip using analytical techniques in 50th, no detailed descriptions of this chip had been available. We performed a petrological and noble gas study of the "Hachioji" chip. Polished thick and thin sections (PTSs) are made from 20 mg chip and examined optically and with a scanning electron microscope and electron microprobe analyzer (EPMA). Coarse powders, 0.7 and 5.4 mg were used for X-ray diffraction (XRD) analysis and noble gas study respectively. The powder sample for noble gas analysis was embedded in resin and polished to investigate with EMPA. The sample was washed and recovered from the resin and used for noble gas analysis. We also performed the same analyses for the Sone meteorite for comparison. PTSs of Hachioji and Sone show moderately recrystallized textures with a few chondrules. Large FeNi metal nodules are observed. The shock stages of both the meteorites are S1. Olivine Fa in Hachioji range from 17.96-20.06, and those of Sone, 17.91-19.62. Pyroxene Fs for Hachioji range from 15.46-17.29 and those for Sone from 15.80-17.82. The results indicate that Hachioji chip is a H5 chondrite, the same group as Sone. Their cosmic ray exposure and K-Ar ages are close to each other, and average 19.3 ± 2.9 Ma and 4.49 ± 0.41 Ga, respectively. There is no difference in petrologic and noble gas data of these two meteorites. This may indicate that the 0.1 gram chip found in the classical envelope was in fact part of Sone. However, considering the fact that H5 comprise ~20% of world meteorite collection, we cannot rule out the possibility that Hachioji and Sone fell separately but are the same group of meteorites.

Keywords: meteorites, ordinary chondrites