Noble gas isotopic compositions and water contents in tektites from Hainan Island, China

Yoshihiro Shimo[1]; Takuya Matsumoto[2]; Gyorgy Czuppon[3]; Tadashi Yokoyama[4]; Satoru Nakashima[5]; Jun-ichi Matsuda[6]

[1] Earth and Space science, Osaka Univ.; [2] ISEI, Okayama Uni.; [3] Earth and Space Science, Osaka Univ.; [4] Dept. Earth and Space Science, Univ. Osaka; [5] Dept. Earth & Space Sci., Osaka Univ.; [6] Earth and Space Sci., Osaka Univ.

Tektites are natural silicate glasses, up to a few centimeters in size, which have colors ranging from green or brown to black. Earlier views that they are from extraterrestrial body had been denied because of apparent absence of cosmogenic noble gases in them. It is now widely accepted that tektites have been formed from cooling of melts produced by the impacts of large meteorites on Earth's surface. Thus, tektites cannot be found everywhere on the Earth; their occurrence are restricted in four strewnfields (Australasian, North America, Ivory Coast and Central European); among these four fields, the Australasian field has had no known impact crater associate with it.

We have collected tektites from several localities in Hainan Island of China which is located in northern edge of the Australasian strewn filed. There are very limited researches so far made on the Hainan tektites including their noble gas compositions. In order to better understand their origin and formation process, we analyzed their noble gas concentrations and the H_2O contents with the quadrupole mass spectrometer and the infrared spectroscopy (FT-IR micro spectrometer), respectively.

Noble gases were extracted by in vacuo crushing aiming to extract gases trapped in vesicles of samples. The released gases are purified and admitted to the mass spectrometer operated under static vacuum to obtain elemental abundances of ^{20}Ne, ^{36}Ar, ^{84}Kr, ^{132}Xe and the isotopic composition of Ne and Ar. As for the FTIR analysis, doubly polished thin slices with different thickness were prepared. An absorption band around 3600 cm^{-1} due to OH stretching vibrations was observed in the IR spectra. The H_2O content was calculated from the peak height at 3600 cm^{-1} after a baseline correction from 2500 to 4000 cm^{-1}.

As commonly found in tektites, the present samples showed enrichment in Ne with respect to the atmospheric noble gas composition. Degrees of their neon enrichment expressed as F(Ne) (= (Ne/Ar)sample/(Ne/Ar)air) are 8˜11, which appear to be significantly smaller than those reported for normal-type tektites having F(Ne) ranging between 100 and 1000. Similarly smaller degree of neon enrichments were previously reported for Muong Nong-type tektites which are classified as a type of tektites distinguished from normal type by their chemical and morphological features. The H_2O contents of our samples are ranging from 0.018wt% to 0.031wt%. These values also agree with those found in Munog Nong-type tektites (0.01wt%˜0.031wt%), showing clear differences from volcanic glasses (over 0.1wt%) and normal tektites (0.002wt%˜0.02wt%). The Muong Nong-type tektites are mostly found in Laos and the west part of Hainan Island. Based on the shape and the chemical composition of these tektites, some researchers consider that the Muong Nong-type tektites can only be found close to the impact crater. Our results show the existence of Munog Nong-type in Hainan Island and might give a clue to specify the location of the crater of the Australasian tektites.