Noble gases in polymict breccia

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Polymict breccias are stony meteorites including clasts of different meteorite groups or petrologic types. It is generally agreed on that the brecciated meteorites formed by gardening on asteroidal parent bodies (Housen *et al.*, 1979). Regolith breccias are available for the research of early solar activity because some of them preserve plenty of solar noble gases. In the present study, nine Antarctic polymict breccias are preliminarily measured using laser gas-extraction technique and two meteorites with high concentrations of solar noble gases are selected to the next step investigation. Noble gas analyses with stepwise heating method were done for two selected Antarctic meteorites — Asuka-87191 and Asuka-87214 — and Gladstone (H4).

Results

Two Asuka meteorites have high concentrations of solar-derived He and Ne, which were released at relatively low temperature steps. Since cosmogenic nuclides were dominant at high temperature steps, $^{3}He/^{4}He$ and $^{21}Ne/^{22}Ne$ ratios rose with temperature. Ar isotopic compositions were mainly contributed by three components: atmospheric, radiogenic, and cosmogenic. Ne isotopic compositions of them were simply explained by the mixing of solar and cosmogenic component. The two Asuka meteorites had similar noble gas release profiles. On the other hand, Gladstone had a distinctive release profile. SEP-Ne in Gladstone was released at high temperature steps of 1200 and 1400°C, showing SEP component was strongly preserved in the meteorite. Cosmogenic-Ar was not main component in the meteorite and $^{38}Ar/^{36}Ar$ ratios at high temperature steps were relatively low. Solar component was not dominated in heavy noble gases of the three meteorites. Since $^{4}He/^{20}Ne$ ratio higher than SW was detected in Asuka-87191 at 600°C fraction, sixteen-steps-heating analysis was carried out for the meteorite. Noble gas release profiles and isotopic compositions of the meteorite suggested the presence of two components, named as early solar wind and second component. The early solar wind component was released at <550°C, it had SW-like He and extremely high $^{4}He/^{20}Ne$ ratio. The composition of this component may reflect the most primordial noble gas composition in the solar system. The second component was released at 650 to 900°C, and its $^{3}He/^{4}He$ ratios form a metastable ratio of 9×10^{-4}, which might be derived from Coronal Mass Ejection (CME)-generated excess ^{3}He. $^{20}Ne/^{22}Ne$ ratio of this component could not be accurately determined, but it is presumably close to SEP or Q.

Reference

Housen K.R., Wilkening L.L., Chapman C.R. and Greenberg R. (1979). *Icarus* **39**, 317-351.

A study on geochemical behavior of minor and REE elements in loam and andosol

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The stratum disposition of radioactive waste from atomic powerplant has been a problem at present. The plan of disposition of high level radioactive waste 300~1000m below sea level, is underway. However, there is possibility that it can lift upward by upheaval or erosion. Low level radioactive waste is likely to dispose around soil zone. From the above-mentioned, the affection of radioactive waste elements seem to have the large significance on environmental chemistry. The natural analogue has proceeded on both andosol and loam which are distribute widely throughout Japan. The main objective of this study is :[1] to clarify the weathering process of andosol and loam; [2] to see the long-term [10~20 thousand years] advance of soil is appropriate for radioactive waste disposition.

The sampling has been performed at kanagawa, Ishigaki Island, main land of Okinawa and Shizuoka. All the samples are normalized with a less-weathered sample to study a weathering process on mineral dissolution and on nature of mineral elements.

From the result of this research, _____ is unaffected by weathering relative to the loam. This is due to weathering resistance, pH, or ion exchange reaction on each element. In fact, some of elements [like Fe] have showed stable behavior or less-weathered in long term. For radioactive disposition, U or Zr is stable for long-term and loam is suitable soil for disposal place under weathering process. To concern about radioactive element such as Cs, Ra, Am and Cm, loam is suitable soil for long-term stabilization and weathering process of same chemical property in Sr, Rb and REE.