Sources, distributions and transport processes of Pu isotopes in the NW Pacific margin

JIAN ZHENG* AND MASATOSHI YAMADA

Nakaminato laboratory for Marine Radioecology, National Institute of Radiological Sciences, Japan
(*correspondence: jzheng@nirs.go.jp)

Plutonium was introduced into the environment mainly from the fallout of atmospheric nuclear weapons tests. Over the past years, we have made a systematic investigation on the distribution of Pu isotopes in the NW Pacific Ocean and its adjacent seas: the East China Sea, Okinawa Trough, the Japan Sea and the Okhotsk Sea. Based on the obtained ^{240}Pu/^{239}Pu ratio signature, we identified the wide presence of Bikini close-in fallout Pu in the studied regions, which contributed to the excess Pu inventories. We proposed that the oceanic process is responsible for the wide presence of Bikini close-in fallout Pu. Using a two fallout end-member model, we resolved the relative contribution of Pu between global fallout and close-in fallout in sediments. We concluded that the contribution of Bikini close-in fallout Pu ranged from 10 % to 60 % in the studied regions [1-5].

To verify our hypothesis on the oceanic process for the transport of Pu in the Pacific Ocean, we further investigated the Pu isotopic signature in seawater and settling particles in the western Northwest Pacific [6-7]. Three transport processes were identified to be responsible for the distribution and fate of Pu isotopes in the NW Pacific margin: (1) advective lateral transport of dissolved Pu from open ocean to ocean margin; (2) vertical transport of Pu isotopes via particle scavenging; and (3) the bottom layer lateral transport and redistribution of Pu isotopes.

[1] Zheng & Yamada (2004) *ES&T* **38**, 3498-3504. [2] Zheng &Yamada, (2005) *Stoten* **340**, 199-211. [3] Wang & Yamada (2005) *EPSL* **233**, 441-453. [4] Zheng & Yamada (2006) *JRNC* **267**, 73-83. [5] Zheng & Yamada (2005) *JEM* **7**, 792-797. [6] Yamada *et al*. (2007) *JER* 98, 274-284. [7] Zheng & Yamada (2006) *ES&T* **40**, 4103-4108.

Determination of lead isotopes ratio in rock samples by ICP-MS

PEI-XI ZHENG[1], YAN ZHOU[2], TIE-FU WANG[2] AND LI LIU[3]

[1]College of Earth Sciences Jilin University Changchun,China 130061
[2]Center of Test Science and Experiment Jilin University Changchun China 130026
[3]Museum, Jilin University,Changchun 130026,China

Lead has four nature isotopes: ^{204}Pb, ^{206}Pb, ^{207}Pb, ^{08}Pb. Generally, it is treated as a steady reference isotope. ^{206}Pb, ^{207}Pb, ^{208}Pb is the descendant of ^{238}U, ^{235}U and ^{232}Th. It abundance is continuously changing. Through the geochemistry research of lead isotope, the mineralogenetic epoch or pattern age could be confirmed. The origin of metallogenic substance and mineral deposit could also be judged.

Conventional method for measuring lead isotope is using the ion exchange technique to separate and gather lead, then test the lead isotope by the TIMS. Using This process, the sample is easily to be polluted. So it need to be processed in ultra-clean lab. For obtaining exact lead isotope data, the tests always expend long time and cost high expenses.

The paper decomposed the rock samples in carius tube sample digestion, and tested the samples with ICP-MS. First weigh up 50 mg rock samples, use $HF+HNO_3+HCLO_4$ mix acid to dissolve the samples in carius tube sample digestion, keep 48h in 190 „ then fix the samples into constant-volume in 50ml, and test the samples with ICP-MS. Before testing, the ICP-MS must be debugged, make sure the oxide < 0.5%, dipole layer<1%, 205 (Tl) in 10 ppb's response value > 12000cps/s. Through repeat test of the lead isotope standard material NIST NBS981, the degree of precision (<5％RSD) and accuracy meet the requirements of the applied research. In the lead isotope testing with international standard BCR-2 rock samples, the results consistent with the standard values. Then the paper tested the lead isotope in 10 rock samples, and obtained ideal analysis effects.

[1] Beauchemin. D. Inductively coupled plasma mass spectrometry. *Analytical Chemistry*, 2008. **80**(12)