

^{129}I as an oceanographic tracer in the Japan Sea

T. SUZUKI^{1*}, M. MINAKAWA², S. OTOSAKA³
AND O. TOGAWA³

¹Japan Atomic Energy Agency, Aomori 035-0053, Japan
(suzuki.takashi58@jaea.go.jp)

²National Research Institute of Fisheries Science, Kanagawa
236-8648, Japan

³Japan Atomic Energy Agency, Ibaraki 319-1195, Japan

Introduction

Iodine-129 is a natural occurring radionuclide with a half life of 15.7 Ma. During last six decades, ^{129}I has also been released in the environment by nuclear weapons testing and the operation of nuclear fuel reprocessing plants.

The Japan Sea is a semi-enclosed marginal sea. The turnover time of water was reported about a few hundred years which was much shorter than that of the Pacific Ocean. Some of long-lived artificial radionuclides, therefore, would be useful tracers to study the oceanic circulation in the Japan Sea. In this paper, we summarize our recent studies of the Japan Sea using ^{129}I .

Experimental

To investigate the potential of ^{129}I as oceanographic tracer in the Japan Sea, seawater samples were collected at 7 stations by cruises of R/V Soyo-Maru and T/S Osyoro-Maru in 2007. Iodine isotopic ratios were measured by an accelerator mass spectrometry at the Mutsu Office of the Japan Atomic Energy Agency.

Results and Discussion

1. Fractions of ^{129}I source in surface seawater were estimated using a natural isotopic ratio and fission yield. This estimation suggests that ^{129}I in surface seawater consists of natural occurring (2%), weapons testing (10%) and reprocessing plants (88%) [1].
2. The averaged surface concentration of ^{129}I in a subarctic circulation was higher than that in a subtropical circulation. Taking account of the location and the total amount of ^{129}I released from reprocessing plants in EU, this different concentration would indicate that ^{129}I released from those plants is supplied to the Japan Sea.
3. The concentration of ^{129}I in the Japan Sea bottom water (JSBW) was higher than that of the natural level. This result indicates anthropogenic ^{129}I is transported vertically by winter convection [2] and the turnover time of the JSBW is estimated to be about 200 years.

[1] Suzuki et al, (2008) *Nucl. Instr. & Meth.* **268**, 1229–1231.

[2] Suzuki et al, (2009) *Qua. Geochrono.* **3**, 268–275.

Selenate reduction by iron-reducing bacteria isolated from Bangladesh soil

Y. SUZUKI^{1*}, R. OYAMA¹, H. SAIKI¹, K. TANAKA²
AND T. OHNUKI³

¹School of Bioscience and Biotechnology, Tokyo University
of Technology, 1404-1 Katakura-cho, Hachioji, Tokyo
192-0982, Japan

(*correspondence: yosuzuki@bs.teu.ac.jp)

²Institute for Sustainable Sciences and Development,
Hiroshima University, 1-3-1 Kagamiyama,
Higashi-Hiroshima, 739-8530 Japan

³Advanced Research Center, Japan Atomic Energy Agency,
Tokai, Ibaraki 319-1195, Japan

Introduction

Microbial reduction of highly soluble selenate and selenite to insoluble elemental selenium is an important phenomenon affecting the mobility of selenium and useful to remediation of Se-contaminated soils. Previously, we had reported the selenite reduction by *Shewanella putrefaciens* [1]. In this study, we examined the selenate reduction by iron-reducing bacteria isolated from Bangladesh soil.

Experimental

Soils from Samta Village, Jessore, Bangladesh were used to start an enrichment culture with H_2 as a potential electron donor and Fe(III)-EDTA as a electron acceptor (Fe-medium). The enrichment was purified by serial dilution with Fe-medium. Analysis of 16S rRNA sequence of the isolate was conducted. Selenate reducing ability of the isolate was examined in an anaerobic medium containing 5 mM Na_2SeO_4 with a gas phase of $\text{H}_2\text{-CO}_2$ (80:20). Effect of iron on the selenate reduction was investigated in media containing 5 mM Na_2SeO_4 and 0-20 mM Fe(III)-EDTA. Precipitates occurred in the media were analysed by XANES spectroscopy.

Results and Discussion

An iron-reducing bacterium, designated L1, was isolated by the serial dilution. Results of 16S rRNA analysis showed that L1 is a novel species and close to *Desulfotomaculum guttoideum* and *Clostridium celerecrescens*. L1 grew in the medium with 5 mM selenate. Cell density of L1 increased with reduction of selenate to selenite, meaning that the bacterium respire selenate. Followed by the selenate reduction, selenite was reduced to elemental selenium forming red precipitates. In the presence of Fe(III), the red precipitates were initially formed and later they turned black precipitates. The XANES analysis indicated that the red and black precipitates contained Se (0) and Se (-II), respectively.

[1] Suzuki et al. (2010) *GCA* **74**, A1011.