

## Iodide oxidation and iodate reduction by marine bacteria

S. AMACHI<sup>1</sup>, T. FUJII<sup>1</sup> AND Y. MURAMATSU<sup>2</sup>

<sup>1</sup>Dept. of Bioresources Chemistry, Matsudo, Chiba University, Chiba, Japan (amachi@faculty.chiba-u.jp)

<sup>2</sup>Dept. of Chemistry, Gakushuin University, Mejiro, Tokyo, Japan (yasuyuki.muramatsu@gakushuin.ac.jp)

The mobility and the speciation of iodine are affected by bacteria through biological processes such as volatilization [1,2] and accumulation [3]. In aqueous environments such as seawater, the predominant chemical forms of iodine are iodide ( $I^-$ ) and iodate ( $IO_3^-$ ). Although  $IO_3^-$  is a thermodynamically more stable form of iodine in seawater, significant quantities of  $I^-$  can be observed in surface and near-bottom layers. Conversely, some oxidation of  $I^-$  must be mediated in seawater. However, autooxidation of  $I^-$  to  $IO_3^-$  does not occur in seawater, since the first step of  $I^-$  oxidation, i.e. oxidation of  $I^-$  to molecular iodine ( $I_2$ ), is a thermodynamically unfavorable reaction. Thus,  $I^-$  oxidation and  $IO_3^-$  reduction are probably mediated by biological activities. The aim of this study is to isolate marine bacteria with capacities for oxidizing and reducing iodine.

$I^-$ -oxidizing bacteria (IOB), which oxidize  $I^-$  to  $I_2$ , were isolated from seawater and natural gas brine water [4]. Based on 16S rRNA gene sequences, they were divided into two distinct groups (*Roseovarius* sp. and unidentified bacteria), and  $I^-$  oxidation was mediated by an extracellular enzyme. Interestingly, IOB produced not only  $I_2$  but also volatile organic iodine compounds, diiodomethane ( $CH_2I_2$ ) and chloriodomethane ( $CH_2ClI$ ).

$IO_3^-$ -reducing bacteria (IRB) were isolated from marine surface sediment. They were identified as *Pseudomonas stutzeri*, a bacterium known as a nitrate reducer. Although IRB could not use iodate as a sole electron acceptor for growth, cell suspension of IRB reduced iodate in the presence of electron donors (acetate, succinate, and glycerol) under anaerobic condition. Iodate-reducing activity was inducible by iodate but not by nitrate, and it was found to be a membrane-bound enzyme.

### References

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## Chlorine stable isotopes from passive and active continental margins as tracers of advective fluid flow

R. HESSE

Earth & Planetary Sci., McGill U., Montreal, QC, Canada  
(hesse@eps.mcgill.ca)

Ocean drilling of the past two decades has led to a growing awareness of the significance of advective fluid flow in modern continental margins and the recognition of fundamental differences in the flow patterns between passive and active margins. In this presentation, chloride and chlorine stable-isotope profiles from passive-margin ODP leg 164 (Blake Ridge; Hesse *et al.*, 2000) and active-margin legs 131 and 190 (Nankai Trough; Spivack *et al.*, 2002) are compared.

At passive-margin Site 997 (Blake Ridge gas-hydrate field) a pronounced steady downward depletion of  $^{37}Cl$  in pore-water to nearly -4‰  $\delta^{37}Cl$  at ~750 m below sea floor (mbsf) is associated with a 10%  $Cl^-$  decrease relative to seawater. Chlorinity reductions in hydrate-bearing sediments commonly result from fresh-water release by hydrate melting. However, in-situ  $Cl^-$  measurements at Site 997 suggest that >50% of the chlorinity reduction occurred prior to hydrate dissociation. Modeling the chlorinity profile shows that vertical advection of a  $^{37}Cl$  depleted, low-chlorinity (506 mM) water from below the drilled sequence (advection rate of 0.18 mm/y) can explain the reduction prior to sampling. Its source will be discussed.

In the Nankai Trough ODP site 808,  $\delta^{37}Cl$  values decrease from near-seawater values (0‰) near the sediment/ water interface to a minimum of -7.8‰ below 600 mbsf in order to return to heavier values near the top of the oceanic basement indicating rapid lateral advection (estimated rates of up to 13.5 cm/y) of strongly  $^{37}Cl$ -depleted fluids of different origin within the accretionary wedge parallel to the decollement zone. The depletion in  $^{37}Cl$  is accompanied by  $Cl^-$  decreases below 400-600 mbsf between ~10% and 20%.

### References

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