OMICS Group Conferences
Accelerating Scientific Discovery
2nd International Conference on
Earth Science & Climate Change
July 22-24, 2013 Embassy Suites Las Vegas, NV, USA

Accelerated dissolution of metal oxides trapped in ice

Wonyong Choi
Pohang University of School of Environmental Science and Engineering, Science and Technology (POSTECH), Korea

Ice is one of the most ubiquitous solids on Earth, being present in the atmosphere, terrestrial surface, and ocean environment. Many environmental reactions taking place in ice are significantly different compared to aqueous counterparts. We investigated some redox chemical reactions in ice, especially those which have environmental significance. First, we studied the reductive dissolution of iron oxides and manganese oxides trapped in ice and investigated their relevance to bioavailability. When iron or manganese oxides were trapped in ice, the release of metal ions (Fe^{2+}, Fe^{3+}, and Mn^{2+}) upon thawing was significantly accelerated. The enhanced dissolution of naturally occurring metal oxides in ice can serve as an efficient pathway for supplying bioavailable metal ions to organisms in the environment. We also studied the redox conversion of chromate and arsenite as model inorganic oxyanion contaminants in ice. The simultaneous redox transformation of chromate (Cr(VI)) and arsenite (As(III)) was greatly enhanced in ice both in the presence and absence of light. This characteristic phenomenon in ice described above is mainly ascribed to the so called "freeze concentration effect". When water begins to solidify to ice, organic/inorganic solutes, protons, and dissolved gases are excluded from the ice crystals and subsequently concentrated in the liquid-like grain boundary region. The highly concentrated substrates in ice grain boundaries can cause distinct outcomes that are markedly different from the aqueous counterparts. The environmental redox chemical reactions occurring in ice may have significant effects on the chemical transformation processes in the icy environment such as polar region, upper atmosphere, and frozen soil.

Biography

Wonyong Choi received Ph.D. in Chemistry from CALTECH (Pasadena, USA) in 1996 and joined POSTECH in 1998 as an Assistant Professor and became a fulltime Professor in 2008. His main research interests are mainly focused on semiconductor photocatalysis, environmental (photo) chemistry, and environmental ice chemistry. Dr. Choi has published more than 180 articles which have been cited more than 16,000 times in scientific journals. He serves as an editor of Journal of Hazardous Materials (Elsevier: 2008-present) and has been in the advisory board of Journal of Physical Chemistry (ACS: 2009-2011) and Energy and Environmental Science (RSC: 2008-present).

wchoi@postech.edu