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INTRINSIC CHEMICAL CONVERSION OF HEAVY METAL IN POLAR REGION

Kitae Kim (*Korea Polar Research Institute (KOPRI), Republic of Korea*)

ktkim@kopri.re.kr

The redox conversion of heavy metals is critically affected by properties of the environmental media. While the chemical transformations of heavy metals in aquatic environments have been extensively investigated, those in the ice media have been studied in only a few cases. Although most of the chemical reactions take place slowly in lower temperature, some processes are accelerated in ice phase. Chromium redox chemistry is important process not only in nature but also engineering. Hexavalent chromium reduction arrest attention much in the field environmental science because of its acute toxicity. Cr(VI) reduction in the presence of various organic reductants, which takes place very slowly in aqueous solution, was significantly accelerated by freezing. We also investigated the simultaneous removal of Cr(VI) and As(III) (as arsenite) in ice phase in comparison with their counterparts in aqueous solution. The accelerated Cr(VI) reduction and the simultaneous removal of Cr(VI) and As(III) reaction by freezing are explained by concentrated organic reductant(or arsenite) and lowered pH value in ice crystal grain boundaries, that is “freeze concentration effect” and “pH effect” respectively. The observed intrinsic chemical conversion by freezing indicates new pathway of natural heavy metal transformation in polar regions.