Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

AGE04-04 Room:301A Time:May 24 11:00-11:15

Effects of temperature environment in dissolution and chemical forms of heavy metals of sediment in Arakawa lowland

UEKI, Takashi[1] ; SAITO, Takeshi[1*] ; HAMAMOTO, Shoichiro[2] ; KAWAMOTO, Ken[1] ; KOMATSU, Toshiko[1]

[1]Graduate School of Science and Engineering, Saitama University, Saitama, JAPAN, [2]Graduate School of Agricultural and Life Sciences, The University of Tokyo, Tokyo, JAPAN

Global warming, heat island phenomenon in urban areas, and increased use of geothermal energy would affect the subsurface thermal, chemical, and biological environment. Change in subsurface temperature might affect dissolution and transport of chemical materials and the subsurface microbial activities. However, effects of temperature change on the subsurface environment including dissolution and chemical forms of heavy metals have not been fully clarified. In this study, effects of temperature on dissolution and chemical forms of heavy metals in sediment of Arakawa Lowland, Kanto district, Japan have been investigated by laboratory experiments.

Laboratory experiments to evaluate the relation between temperature and dissolution characteristics were conducted under three different temperature conditions (15^{o}C, 25^{o}C and 40^{o}C). Five chemical forms of heavy metals in residues from the dissolution experiment were also fractioned (Water soluble, Exchangeable, Bound to carbonates, Bound to iron and manganese oxides and Bound to organic matter) by the sequential extraction method. These experiments were conducted on sediment samples obtained from boring cores at around 17m, 31m, 39m and 44m depth (denoted as 17m-sample, 31m-sample, 39m-sample and 44m-sample, respectively).

Results showed that temperature conditions affected dissolution characteristics and chemical forms of heavy metals. Especially, boron in 17m-sample (marine sediment) and arsenic in 31m-sample (non-marine sediment) dissolved more at higher temperature and linear relations between temperature and dissolved concentration of these components were observed. Additionally, temperature condition also affected their chemical forms. Under 40^{o}C and 25^{o}C conditions, Bound to iron and manganese oxides and Exchangeable forms of boron in 17m-sample both decreased and Water-soluble boron increased compared to the 15^{o}C condition. Also under 40^{o}C and 25^{o}C conditions, Bound to iron and manganese oxides form of arsenic in 31m-sample decreased and Water-soluble and Exchangeable arsenic both increased compared to the 15^{o}C. These results imply that hardly-soluble forms of boron and arsenic might change to readily-soluble forms at higher temperature.

Keywords: subsurface temperature, dissolution characteristics, chemical forms, alluvial sediment