Equilibrium Sorption of Heavy Metals (Pb, Zn, Cd, Cu) onto Scoria: Comparison with Hematite and PAC

Jang-Soon Kwon · Seong-Taek Yun[1)]

Heavy metal release from wastewater is a serious environmental problem, and therefore various techniques of wastewater treatment have been suggested. Among the techniques, sorption is most attractive. Activated carbon, silica gel, and activated alumina are still popular as adsorbents, but they are limitable because of expensive costs. Thus, considerable researches are recently focussed on the search of inexpensive adsorbents especially developed from various natural materials such as smectite, magnetite, goethite, granite, tuff, sand, clay minerals, etc. Scoria is a bomb-sized pyroclast that is reddish or black in color, light in weight, and generally vesicular. In this study, scoria from Cheju island is examined for the use as a sorbent. It is composed of plagioclase, olivine, hornblende, pyroxene, and glass, with a composition of 45.54% SiO_2, 14.95% Al_2O_3, and 12.88% Fe_2O_3.

Studies on kinetic isotherm sorption of Zn onto scoria was carried out using an agitated batch. Various parameters such as initial zinc concentration, particle size, and adsorbent/adsorbate ratio were examined. Preliminary results suggest that the smaller size and the larger amounts of scoria yield the higher degree of zinc ion removal. More effective removal also appears at lower initial Zn concentration. Furthermore, the sorption behavior of Zn ion onto scoria seems to be mainly controlled by cation exchange. The results of equilibrium isotherm sorption of other heavy metals (Pb, Zn, Cd, Cu) onto scoria are similar with those on Zn. The sorption abilities of scoria, hematite (ferric oxide), and PAC (particular activated carbon) are also compared in this study.

Key words: Sorption, Heavy metals, Scoria, Cation exchange

1) Dept. of Earth & Environ. Sci., Korea Univ.(styun@mail.korea.ac.kr)