

# Adsorption Behavior of Heavy Metals to Oxides Under High Alkaline Conditions

\*Natsumi Takeda<sup>1</sup>, Keisuke Fukushi<sup>2</sup>

1. Kanazawa University, 2. Institute of Nature and Environmental Technology Kanazawa University

Surface soil has an impact on human health. For example, heavy metals in soil can be taken into the body when they dissolve in water and are absorbed by crops. The conditions under which heavy metals are dissolved from the minerals are different for each element. In general, the concentration of heavy metals in solution depends on the adsorption and desorption reactions on minerals. Understanding these reactions is important for clarifying the mobility of heavy metals at the surface. The adsorption of heavy metals depends on the charge on the mineral surface. The mineral surface in solution is covered with surface hydroxyl groups. Under low pH conditions, the surface is positively charged and adsorbs anions, while under high pH conditions, the surface is negatively charged and adsorbs cations.

In Takeda et al. (JPGU2020), I conducted desorption experiments from contaminated soils under various water quality conditions using soil from the Kamegai Mine (Toyama Prefecture). The results showed a slightly different trend from the general heavy metal desorption behavior described above. At low pH, the desorption concentration of heavy metals was high and decreased as the pH increased. However, at higher pH, the cation concentration was expected to decrease, but the desorption concentration increased. The behavior of re-desorption of heavy metals at such high pH has rarely been reported so far. In this study, we are trying to clarify the adsorption behavior of heavy metals on minerals under high alkaline conditions. The adsorption behavior of lead under pH conditions (3-12) was investigated using synthetic goethite.

The results showed that the Pb concentration in the solution was high at low pH, and the concentration decreased with increasing pH. On the other hand, although the concentration of Pb in the solution reached a minimum value around pH 10, the concentration of Pb increased at pH 10-12 and rose to a value about one order of magnitude higher than the minimum value. No effect of ionic strength was observed.

Acid mine wastewater is generally neutralized by the addition of slaked lime. Sato and Tazaki(2000) measured the water quality in the sedimentation pond where the treated wastewater from the Ogoya Mine in Komatsu City, Ishikawa Prefecture, flowed in. The results showed that the water in the setting pond was neutral to alkaline with a pH range of 6.3 to 12. This pH range includes not only the pH range with the lowest dissolved concentration in the results of this study, but also the pH range where releaching occurs. This suggests that heavy metals may not have been removed from the solution because the re-elution at high pH was missed.

Keywords: surface complexation modeling, heavy metal, desorption