Cadmium, lead, zinc and arsenic partitioning in earth surface materials in soils from Kamegai mine tailing, Toyama Prefecture in Japan

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Mining extraction and processing generate large volumes of metal- rich waste tailings. This waste is considered be a principal cause of soil contamination in mining areas (Rashed, 2010; Pe-Leve Santos et al., 2014). Once these toxic metals are introduced into soils, they can be transported deeply into the soil and into groundwater, threatening environmental health. The objectives of this research were to analyze the concentration of several heavy metals (Zn, Pb, As and Cd) in soils from a Kamegai mining waste area, determining the chemical partitioning of those heavy metals using the sequential extraction procedure. It can help to understand the mobility of heavy metals and predict their effect.

Thirty-four soil samples were collected for geochemical and rock magnetic analyses from the Kamegai mine tailing. Also in-field magnetic susceptibility measurements of the soil surface were done at locations where soils samples were collected.The 2mm sieved samples were analyzed to determine the metal concentration by the chemical fractionation of Cd, Pb, Zn and As by the modified sequential extraction procedure. Sequential extraction showed that most of the As, Zn and Pb was associated with the poorly crystalized iron oxide, while Cd was associated with the carbonate fraction in samples. The partitioning of Pb and Zn in the iron oxide is more labile the As at weak acid (pH 5) solution, probably due to the pH dependent surface charge behavior of the iron oxide as indicated by the laboratory and modeling studies. The in-field magnetic susceptibility of topsoil was clearly correlated with Fe, Zn, Pb and As concentrations.

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