

# **Spatial distribution and correlation analysis of heavy metals extracted from borehole core samples collected at waste rock dumps of an abandoned mine.**

MIU NISHIKATA<sup>1</sup>, YOHEY HASHIMOTO<sup>2</sup>, TETSUO YASUTAKA<sup>1</sup>, SHINJI MATSUMOTO<sup>1</sup>, TOMOKO OGURI<sup>1</sup>, YOSHIAKI KON<sup>1</sup> AND DAISUKE ARAOKA<sup>1</sup>

<sup>1</sup>The National Institute of Advanced Industrial Science and Technology

<sup>2</sup>Tokyo University of Agriculture and Technology

Presenting Author: [m.nishikata@aist.go.jp](mailto:m.nishikata@aist.go.jp)

Waste rock dump drainage contains high levels of heavy metals such as Cu, Pb, and Zn. Leaching behavior of heavy metals from the waste rocks affected by concentration of the Heavy metal, groundwater level, coexistent ion, pH and oxidation state. In order to reduce the costs required for the management of drainage system, it is essential to understand the leaching mechanism of heavy metals from the waste rock dumps. To clarify the factors affecting the leaching behavior of heavy metals from the waste rocks, we collected the drill-core samples from three boreholes(upper, middle and lower areas) in the waste rock dump. Then, leaching tests for heavy metals on drill-core samples were conducted. These waste rocks were derived from epithermal Au deposit and composed mainly of sulfides with high contents of Cu, Pb, and Zn. Air-dried core samples were passed through a 2 mm sieve and used for the leaching test. We measured pH, EC, concentrations of sulfate ion and heavy metals of sieved samples. The highest amount of heavy metals, especially Cr, Mn, Ni, Cu, Zn, and Cd, were extracted from the drill-core samples from the lower area. The extraction of Co and Pb was the highest at middle area and extraction of Fe and As was the highest at upper area, but the concentrations of the rest of heavy metals were low. The correlation analysis of heavy metals from all sites shows that Mn, Co, Ni, Cu, Zn, Cd, and Pb were positively correlated and weak negative correlations were observed between pH and heavy metals except for As. At the lower area, a strong positive correlation was observed between sulfate ions and Mn, Co, Ni, Zn and Cd. However, at the upper and middle area, positive correlation is week. These differences suggest that the dissolution of sulfide is one of the factors controlling the leaching of heavy metals at lower area. At upper and middle area, however, heavy metals may be present in forms other than sulfide. Our results demonstrate that the chemical forms of heavy metals in waste rock vary in the sampling site of this mining area.