

GEOAVAILABILITY OF METALS IN A MINE-WASTE MATERIAL. Kathleen S. Smith¹, Gregory P. Meeker², Reinhard W. Leinz², Stephen J. Sutley², Holly L.O. Huyck³, and George A. Desborough², ¹U.S. Geological Survey, Federal Center, M.S. 973, Denver, CO 80225-0046, ksmith@usgs.gov, ²U.S. Geological Survey, Federal Center, M.S. 973, Denver, CO 80225-0046, ³P.O. Box 28161-16, Lakewood, CO 80228.

The concept of the availability of metals from natural materials, referred to as the geoavailability, is defined as that portion of a chemical element's or a compound's total content in an earth material that can be liberated to the surficial or near-surface environment (or biosphere) through mechanical, chemical, or biological processes. The geoavailability of a chemical element or a compound is related to the susceptibility and availability of its resident mineral phase(s) to alteration and weathering reactions [1]. Figure 1 illustrates the pathways from total metal content in an earth material to toxicity. Geoavailability is an important step along these pathways. We present examples of geoavailability using mine-waste material. Detailed examination of the residence phase(s) of metals in the mine-waste material is necessary to understand the geoavailability of metals in mine-waste dumps. We use a combination of X-ray microanalysis and chemical-extraction techniques to determine metal residence phase(s) in the mine-waste materials. This information, combined with bulk chemical analysis and X-ray diffraction, can shed light on metal geoavailability and subsequent mobility from mine-waste material.

References:

[1] Smith, K. S. and Huyck, H. L. O. (1999) An overview of the abundance, relative mobility, bioavailability, and human toxicity of metals; in Plumlee, G.S., and Logsdon, M.J. (eds.), *The Environmental Geochemistry of Mineral Deposits, Part A: Society of Economic Geologists, Reviews in Economic Geology*, v. 6A, pp. 29-70.

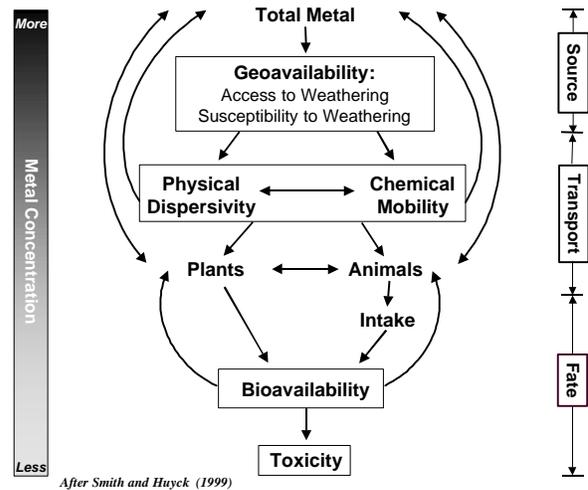


Figure 1. Diagram illustrating the relationship between total metal content and bioavailability with geoavailability.