Assessment of the mobility of heavy metals (Pb, Zn, Cd) and metalloids (Sb, As) in carbonated soils contaminated by mining waste (Northern Tunisia)

Yosra Achour [1,2] Radhia Souissi[1] Mikael Motelica heino[2] Foued Souissi1-[3]
e-mail: yosra.achour@cnrs-orleans.fr
[1] Laboratoire des Matériaux Utiles, Institut National de Recherche et d'Analyse Physico-chimique, Pôle Technologique, Sidi Thabet, 2020 Tunis, Tunisia
e-mail: souissiradhia17@gmail.com
[2] CNRS/ISTO Institut des Sciences de la Terre d'Orléans, UMR-CNRS 7327 Campus Géosciences, 1A rue de la Férollerie, 41071 Orléans, France
e-mail: mikael.motelica@univ-orleans.fr
[3.]Universite´ Tunis El Manar, Faculte´ des Sciences de Tunis, 2092 Tunis, Tunisia
e-mail: souissifoued2@gmail.com

The main objective of this work was to study the mobility of metallic elements (Pb, Zn, Cd) and metalloids (As and Sb) in soils developed on carbonate source rocks in the vicinity of two abandoned mining sites in the north of Tunisia (Jebel Hallouf-Sidi Bouaouane and Jebel Ressas) to assess the potential hazards of these contaminants in soils ecodynamics and the risks to human health.

For Pb, the concentrations can reach 20000 mg / kg in the Jebel Hallouf-sidi Bouaouane soils and 12000 mg/kg in the Jebel Ressas sample. The level of Zn is between 4000 mg/kg and 11000 mg/kg in the samples of Jebel Hallouf-sidi Bouaouane and 60000 mg/kg at Jebel Ressas. The concentrations of Cd vary between 34 mg/kg and 81 mg/kg at Jebel Hallouf-Sidi Bouaouane and 320 mg/kg in Jebel Ressas. For metalloids the highest concentrations are recorded in Sidi Bouaouane of the order of 683 mg / kg for As and 145 mg / kg for Sb.

The leaching results (sequential extraction test) on soils revealed that a small proportion of Pb is mobilized (it does not exceed 1%). The mobility of Sb does not exceed 1% in the Sidi Bouaouane sample and 0.1% for As. Cd reaching 26% in Sidi Bouaouane and 6% in Jebel Hallouf. For Zn the mobility percentage in Jebel Hallouf was around 13%.

Keywords : Soil - Mining discharges - contaminated - sequential extraction - mobility - Northern Tunisia