Geophysical Research Abstracts
Vol. 19, EGU2017-5709, 2017
EGU General Assembly 2017

Geochemical and mineralogical characteristics of percolates and its evaporates from Technosols before and after limestone filler stabilisation.

Carmen Pérez-Sirvent (1), Maria Jose Martinez-Sanchez (1), Maria Luz Garcia-Lorenzo (2), and Manuel Hernandez- Cordoba (3)

(1) Department of Agricultural Chemistry, Geology and Pedology, Regional Campus of International Excellence "Campus Mare Nostrum", University of Murcia, Faculty of Chemistry, Murcia, Spain, (2) Department of Petrology and Geochemistry. Faculty of Geological Sciences. Complutense University of Madrid. Madrid. Spain.. , (3) Department of Analytical Chemistry, Regional Campus of International Excellence "Campus Mare Nostrum", University of Murcia, Faculty of Chemistry, Murcia, Spain

The chemistry of waters is recognized as a relevant monitoring tool when assessing the adverse effects of acid mine drainage. The weathering of sulphide minerals produces a great variety of efflorescences of soluble sulphate salts. These minerals play an important role for environmental pollution, since they can be either a sink or a source for acidity and trace elements. This communication deals with the leachability of potentially toxic elements (PTE) eluting from technosols formed from soils affected by mining activities and limestone filler. A total of three contaminated soils affected by opencast mining were selected and mixed with limestone filler at three percentages: 10 %, 20 % and 30 %, providing nine stabilised samples.
These samples were stored in containers and moistened simulating rainfall. The percolates obtained were collected, and the PTEs content (As, Cd, Cu, Fe, Pb and Zn) was determined. Evaporation-precipitation experiments were carried out in these waters, and the mineralogical composition of efflorescences was evaluated.
The study area is heavily polluted as a result of historical mining and processing activities, producing large amount of wastes, characterised by high trace elements content and acidic pH. The results obtained for the percolates after the rain episode showed that, before the stabilization approach, waters had an acidic pH, high electrical conductivity and high PTEs content. When these soils were mixed with 10, 20 and 30 % of limestone filler, the pH was neutral and the soluble trace element content strongly decreased, being under the detection limit when limestone percentage was 20 % and 30 %.
The mineralogical composition of efflorescences before the stabilisation approach showed that predominant minerals were copiapite, followed by gypsum and bilinite. Other soluble sulphates were determined in lower percentage, such as hexahydrite, halotriquite or pickeringite. After the mixing with 10 % of limestone filler, the evaporates were mainly composed by gypsum and halite. Other minerals such as starkeyite ($MgSO4{\cdot}4(H_2O)$), boyleite ($(Zn,Mg)SO4{\cdot}4H_2O$), tachyhidrite ($CaMg2Cl6{\cdot}12H_2O$) or bischofite ($MgCl2$) were quantified in low percentages. After mixing with 20 % and 30 % of limestone filler, main minerals were gypsum and halite, the presence of other phases being scarce.
The addition of limestone filler to soils polluted by potentially toxic elements represents a useful and low impact strategy for reducing the soluble fractions of As, Cd, Cu, Fe, Pb and Zn.

M.H.C. acknowledges the financial support of the Comunidad Autonóma de la Región de Murcia , Spain (Fundación Séneca, 19888/GERM/15)