Retention and release of some’ heavy elements in polluted soils

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Three surface soil samples (0-30 cm) representing the Nile alluvial, calcareous and sandy soils, besides one clay mineral (montmorillonite), an organic material (humic acid) and CaCO3 were selected to study the retention and release of some heavy elements (Cd and Pb) in polluted soils.Different levels of cadmium in the form of cadmium acetate and lead in the form of lead nitrate were prepared and their solutions were adjusted at pH 6.5 using either NH4OH or HNO3 acid. The adsorption experiments were conducted using a certain weight of soil or the materials under study in bottles reciving a series of final Cd concentrations namely: 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0 and 5.0 mg U’ or Pb concentrations corresponding to 2.5, 5.0, 7.5, 10.0, 20.0, 30.0, 40.0 and 50.0 mg 1:1. The amounts of Cd or Pb sorbed by different soils and materials were calculated as the differences between the added amounts and those found in the final equilibrium solutions.Also, the Cd or Pb- enriched soils and materials of the previous treatments were treated with DTPA solution to determine the amounts of Cd or Pb desorbed from the studied soils and materials.The obtained results could be summarized as follows: 1. Adsorption of Cd or Pb on soils:? The amount of Cd or Pb adsorped on the Nile alluvial,calcareous and sandy soils increased gradually withSummary and Conclusions 114increasing the initial concentration of Cd or Pb, but did notto reach a maximum even at their highest concentrations.?Cadmium or lead values adsorbed on the Nile alluvial soil were lower than the corresponding ones adsorbed on the calcareous soil. The sandy soil seemed to be of the lowest adsorbed values of either Cd or Pb.?The adsorption data of both Cd and Pb on the studied soils fitted the conventional Langmuir isotherm with highly significant correlation coefficients.?Likewise, data were also fitted to Freundlich equation with highly significant correlation coefficients.?Temkin isotherm model was also suitable to be applied on adsorption data of the studied soils, where the correlation coefficients were also highly significant.2- Adsorption of Cd or Pb on active materials:?Cadmium or Pb adsorbed on humic acid, montmorillonite and CaCO3 increased gradually with increasing the initial Cd or Pb concentrations. However, this increase was more pronounced on CaCO3 than the other materials.?The adsorption data of the different studied materials fitted well the conventional Langmuir, Frundlich and Temkin isotherms.Summary and Conclusions 1153- Desorption of Cd or Pb on soils:?The amount of desorbed Cd or Pb from the Nile alluvial, calcareous and sandy soils, generally, increased with increasing the amounts of previously adsorbed Cd or Pb. However, the amount of Cd or Pb desorbed from the calcareous soil exhibited higher values as compared with the Nile alluvial or the sandy soil.?Cd or Pb desorbed from the Nile alluvial, calcareous and sandy soils exhibited a partial irreversibility propably due to the hysterists phenomenon.4- Desorption of Cd or Pb from the studied active materials:?The values of desorped Cd or Pb from humic acid, montmorillonite and CaCO3 seemed to be increased as the initial concentration of the applied Cd or Pb increased.?The amounts of Cd desorbed from humic acid were higher than the retained ones, while the opposite trend was observed for montmorillonite and CaCO3. Amounts of desorbed Cd and Ph from different materials were almost lower than the retained ones.?It can be deduced from the aforementioned results that humic acid, montmorillonite and CaCO3 can be used as additives to the soils polluted with heavy metals for reducing their potentially hazardous effect on plant and human’s health.