

## **IMMOBILIZATION OF Zn AND Pb IN POLLUTED SOIL BY SYNTHETIC ZEOLITE**

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In the last few years, a great deal of research on polluted soils has been carried out in order to develop a low-cost remediation method for reducing the environmental risks due to the presence of heavy metals. In the light of this, the zeolitization achieved in soils mixed with coal fly ash could be a useful answer to reduce the amount and the mobility of metals. In this study, a soil treated with coal fly ash and artificially contaminated with Zn or Pb was used to synthesize zeolite at low temperature both in the laboratory and on a bench-scale experiments.

The mineralogy and morphology of the products were characterized by X-ray diffraction and by scanning electron microscopy, respectively. Adsorbed and exchangeable Zn and Pb were determined by a one-step extraction with ammonium acetate on the samples incubated at 27 °C in laboratory experiments. Pb stability and speciation were investigated by modified BCR sequential extraction on the samples incubated at about 30 °C on bench-scale experiments.

Mineralogical data showed that the synthesis of zeolite X took place readily after the first month and the amount of the newly-formed mineral increased during the entire 1-year-long incubation period thus indicating that the presence of toxic elements did not influence the zeolite growth.

The chemical analysis indicated that a reduction in heavy metal availability took place in the samples. The Zn and Pb concentrations, determined after a single-step chemical extraction, indicated that a smaller amount of toxic element was extracted from the samples of soil containing zeolite. Moreover, the XRD patterns of solid residues still showed the presence of zeolite X thus documenting that the ammonium acetate treatment did not affect the mineral. The chemical solution did not determine any ion exchange reaction; therefore, it did not liberate the metal ion entrapped in the zeolite structure. Chemical sequential extraction analysis confirmed the action of the new formed zeolite in the immobilization mechanism of the toxic element. In particular, the average quantities of Pb extracted by the different three steps changed significantly depending on the presence and amount of the newly formed mineral. These results suggested that zeolite, while forming, encapsulated Pb in its structure thus reducing the mobility of the toxic element. When the structure of the newly-formed mineral was destroyed, the toxic element was mobilized by the action of the different reagents depending on Pb speciation.