APPLICATION OF ZEOLITE SYNTHESIZED FROM FLY ASH FOR THE REMOVAL OF Pb

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In the last few years many water purification processes have been developed and most of them are based on the utilization of low-cost materials with high pollutant-removal efficiency. Among these, zeolites are good and largely used adsorbent materials. They are hydrated aluminosilicate minerals with a three-dimensional open structure which makes them very useful for solving the mobility of toxic elements thanks to their ability to exchange cations, their large surface area and their typical porous structure. These minerals can be synthesized from different source materials and fly ash, a by-product of coal combustion waste, is one of the most used.
In this study, we have carried out column absorption tests to determine the Pb sorption behaviour of zeolite synthesized at a low temperature (60°C) from an Italian coal fly ash. Different amounts of zeolitic material ranging from 10 to 60 g were used with standard solutions containing 10 mg/L of Pb (ion concentration). The solid samples were characterized by X-ray diffraction and scanning electron microscopy. The cation exchange capacity (CEC) was also estimated. The filtered water solutions were analyzed by inductively-coupled plasma spectrometry (ICP-MS).
The synthetic zeolitic material shows a substantial ability to remove heavy metal (average 97%) from contaminated aqueous solutions. Pb concentration already decreases when using 10 g of zeolite. The increasing Na concentrations in the leachate documents that the toxic element is exchanged with Na+ ions. The results also indicate that the amount of Pb removed from solutions does not change significantly with the increasing amount of zeolite and the sorption process already occurs within the first minutes of contact with the contaminated solution.
The results obtained encourage a possible utilization of zeolite formed from waste material with an inexpensive and advantageous method..

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