Solid-Liquid Extraction of Copper from Sulfate Media using Hybrid Material

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During the last decade, extensive investigations by many researchers, have given rise to many new open-framework materials with novel structural features[1]. Of these, aluminophosphates, gallophosphates and zincophosphates appear to be the most dominant. These materials are typically synthesized under hydrothermal or solvothermal conditions in the presence of various organic amines as a structure-directing agent. The organic species used in the zincophosphate system has been extensively studied in order to discover new compounds with open frameworks. A large variety of new microporous zincophosphates with one-, two- or three-dimensional structure has already been reported in the literature. In particular the zincophosphate ND-1, synthesized by Yang and Sevov in 1999, is one of the five microporous solids with the largest rings (24 T, T=Zn, P) [2-3]. Furthermore, the incorporation of organic molecules in mineral structures appears to be very fruitful by its applications in the some areas. Though, in the majority of cases, the organic molecules were hydrogen bonding to the mineral framework or they were trapped in the microporosity of material, they can be directly linked to the inorganic nets via T-C or T-O-C bonds. Thus, the organic amine molecules bond directly with the, Zn or P centers and act as a ligand. Although the majority of the open-framework metal phosphates were synthesized in the presence of organic diamines or polyamines, little work has been carried out employing substituted amines. Aminoacid have been rarely used as directing agents in these systems. Indeed, in our knowledge, only the zincophosphate-asparagine[4] and histidine_zincophosphate, have been reported[5].

Our present study employing methionine amino-acid has resulted in a new layered zincophosphate where the amino-acid bond directly to mineral framework. This hybrid material aminoacid-methionine was used to solid–liquid extraction of Cu(II) from 0.33 M(Na+, H+)SO₄²⁻ sulphate medium at 25° C. The material was characterized by physical chemistry methods such as X-ray diffraction (XRD), IR. The effects of various factors on the adsorption, such as pH of the solution, contact time, were investigated. The solid adsorbed approximately 80% of Cu (II) ions at an initial concentration of 200 mg/l, after two hours.

REFERENCES