

Use of calcium phosphates to remove nickel, copper and cobalt ions from aqueous solutions

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Abstract : This work concerns the use of amorphous tricalcium phosphate and apatitic tricalcium phosphate to remove nickel, copper and cobalt ions from aqueous solutions. The amorphous or apatitic calcium phosphates were first exposed to separate solutions of Ni(II), Cu(II) or Co(II) salts for 48 hours at room temperature, then residual solids and solutions were separated and analysed. X-ray photoelectron spectroscopy, X-ray diffraction and infrared spectroscopy were applied to observe chemical and structure modifications in the solid phosphates whereas inductively coupled plasma atomic emission spectrometry measurements were performed to evaluate the metal ions content changes in both solids and solutions. These analyses and measurements demonstrate the ability of amorphous and apatitic phosphates to remove metal ions from aqueous solutions. They assist in identifying the mechanisms involved in the metal ions transfer from solutions to solid phosphates and clarifying differences with respect to the widely studied hydroxyapatite system. Finally, they reveal, for copper and cobalt ions, the conversion of these phosphates to $\text{Cu}_2(\text{PO}_4)(\text{OH})$ and $\text{Co}_3(\text{PO}_4)_2 \cdot 8\text{H}_2\text{O}$.

Keywords : Amorphous calcium phosphate; apatitic calcium phosphate; hydrolysis; exchange; dissolution-precipitation.

E. Zahidi *et al* / International Journal of ChemTech Research, 2019,12(3): 93-102.

DOI= <http://dx.doi.org/10.20902/IJCTR.2019.120315>
