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Phase composition of the products of reactions in the system Cu^{2+} – $MgNH_4PO_4 \cdot 6H_2O$ – H_2O at low concentration Cu^{2+} ions in solution

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Abstract

It was shown by chemical and physico-chemical methods that reactions in the system Cu^{2+}–$MgNH_4PO_4 \cdot 6H_20$-H_2O result in the formation of the struvite-type phase of variable composition $Mg_{(1-x)}Cu_xNH_4PO_4 \cdot 6H_2O$ ($0 < x < 1$), the relatively unstable phase of cornetite, $Cu_3PO_4(OH)_3$, the phase of bobierrite, $Mg_3(PO_4)_2\ 8H_2O$, and the phase $Cu_3(PO_4)_2 \cdot 3H_2O$. In mother solutions at pH 3.9-6.0, the phase $Cu_3PO_4(OH)_3$ turns to $Cu_3(PO_4)_2 \cdot 3H_2O$. When the molar ratio $n_{Cu}^{2+}:n_{MAP}$ is high (1.73 and 2.31) and the pH value is low (3.0-4.2), libethenite, Cu_2PO_4OH, is the most stable phase. The fact of recrystallization of magnesium-ammonium phosphate hexahydrate (MAP) in the mother solution was also proven. The uptake of Cu^{2+} ions from solution was explained by ion exchange $Cu^{2+} \leftrightarrow Mg^{2+}$ with the phase MAP, trapping by MAP during its recrystallization, and by the formation of other copper-containing phosphates.