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Sorption Preconcentration of Phosphate Ions from Natural Waters on the Calcinated Layer Double Hydroxides of Magnesium and Iron (III)

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It is proposed to use calcined layered double hydroxides magnesium and iron(III) for sorption concentration of phosphate ions and further photometric determination of these anions in natural waters. The conditions and the mechanism of extraction of phosphate ions in dependence on the pH of the aqueous medium and the concentration of anions have been studied. It is shown that highly selective extraction of phosphate ions (98.0–99.2%) on the proposed sorbent is observed in a wide range of pH of aqueous media. The limiting value of adsorption, calculated from the Langmuir equation, for calcined layered double magnesium hydroxide and iron(III) was 91.7 mg/g. On the basis of the obtained results of IR spectrometry it was established that the extraction of phosphate ions from aqueous solutions on a calcined sorbent is caused by electrostatic interaction, the formation of outer-sphere complexes and ion exchange in the interlayer space. The desorption processes were studied and it was shown that the most effective desorbent is sodium hydroxide.

Keywords: phosphate ion, calcined layered double hydroxide, sorption, desorption, preconcentration