

Study of the regularity of the process of decomposition of apatite with sulfuric acid at the boiling point of the solution

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Abstract

Experimental research of the kinetics of the decomposition process of Kovdorsky apatite with a size = 0.16 mm with sulfuric acid in a 1 dm³ batch reactor. Phosphoric acid with the concentration of 68.6 % wt and the sulfuric acid with the concentration of 12.3% wt in stoichiometric amount was introduced at the beginning of the process. The process was carried out at a ratio of liquid and solid phases 2.5:1 respectively at the boiling point of the mixture equal to 136 °C. The observing the progress was carried out according to the method of joint designation of sulfuric and phosphoric acids by titrimetric analysis. With methyl orange and then phenolphthalein 2 titration jumps were recorded, the first of which corresponded to the neutralization of sulfuric acid to Na₂SO₄ and phosphoric acid to NaH₂PO₄, the second to the neutralization of NaH₂PO₄ to Na₂HPO₄. The change in temperature of the reaction mixture was fixed during the process using a mercury thermometer. In the analysis of the derived experimental values of specified parameters that the boiling point decreases from 136 to 133.1 °C within 50 minutes during the process. A comparison of the reported values with the concentration values of sulfuric and phosphoric acids measured during the process shows that the change in boiling point of the reaction mixture is proportional to the change in the concentrations of sulfuric and phosphoric acids. This model is a closed system that provides thermal insulation and no loss of material balance. Thus, the kinetics of the decomposition of apatite with sulfuric acid at the boiling point can be monitored by the temperature change under specified conditions.

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