

The Determination of the Potassium Nitrate, Sodium Hydroxide and Boric Acid Molar Ratio in the Synthesis of Potassium Borates via Hydrothermal Method

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Abstract : Potassium borates, which are widely used in welding and metal refining industry, as a lubricating oil additive, cement additive, fiberglass additive and insulation compound, are one of the important groups of borate minerals. In this study the production of a potassium borate mineral via hydrothermal method is aimed. The potassium source of potassium nitrate (KNO_3) was used along with a sodium source of sodium hydroxide (NaOH) and boron source of boric acid (H_3BO_3). The constant parameters of reaction temperature and reaction time were determined as 80°C and 1 h, respectively. The molar ratios of 1:1:3 (as $\text{KNO}_3\text{:NaOH:H}_3\text{BO}_3$), 1:1:4, 1:1:5, 1:1:6 and 1:1:7 were used. Following the synthesis the identifications of the produced products were conducted by X-Ray Diffraction (XRD) and Fourier Transform Infrared Spectroscopy (FT-IR). The results of the experiments and analysis showed in the ratio of 1:1:6, the Santite mineral with powder diffraction file number (pdf no.) of 01-072-1688, which is known as potassium pentaborate ($\text{KB}_5\text{O}_8 \cdot 4\text{H}_2\text{O}$) was synthesized as best.

Keywords : hydrothermal synthesis, potassium borate, potassium nitrate, santite

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