Phase relations involving chlorbartonite in the K-Fe-S-Cl system

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Due to numerous findings in kimberlites, carbonatites and meteorites, alkaline sulphides are attracting increasing attention as indicators of the mineral formation conditions and mantle composition [1, 2]. Currently, about one and a half dozen sulphides of alkali metals are described, and about half of this number of mineral species belongs to the K–Fe–S–Cl system.

Previously [3], we studied phase relations in the $KFeS_2$–Fe–S system by the dry synthesis method in the range of 300–600°C and at a pressure of 1 bar. At the temperature below 513 ±3°C, pyrite coexists with rasvumite (KFe_2S_3) and there are pyrite–rasvumite–$KFeS_2$ and pyrite–rasvumite–pyrrhotite equilibria established. Above 513 ±3°C pyrite and rasvumite react to form $KFeS_2$ and pyrrhotite, limiting the pyrite–rasvumite association to temperatures below this in nature. The experiments also outline the compositional stability range of the copper-free analog of murunskite ($K_xFe_{2-y}S_2$) and suggest that mineral called bartonite is not stable in the Cl-free system, at least at atmospheric pressure and the temperature in the experiments.

Chlorbartonite ($K_6Fe_{24}S_{26}Cl$) could be easily produced after adding KCl in the experiment. Possible parageneses in the quaternary K–Fe–S–Cl system were described based on the data obtained in this research at temperatures of 400 and 600°C and found in the previous studies [3, 4]. The factors affecting the formation of potassium–iron sulfides in nature will be discussed.

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