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Thermodynamic modeling of phase formation during sintering of wolframite with alkali metal carbonates

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Abstract

Thermodynamic modeling of the sintering of wolframites with alkali metal carbonates was carried out using the software complex HSC Chemistry 6.12. Transformations were considered for $MnWO_4$ – $FeWO_4$ – Na_2CO_3 – (K_2CO_3) systems with additions of SiO_2, Al_2O_3, $FeMoO_4$, close to the real compositions of wolframite concentrates. The simulation was carried out in an air medium (0.1 MPa) with cooling of the working medium from 1273 to 298°K and the amount of alkali metal carbonate equal to the stoichiometrically necessary for the formation of sodium tungstate (potassium tungstate). The replacement of Na_2CO_3 by K_2CO_3 in the working medium under consideration had little effect on the phase composition of the reaction products. The decrease of the temperature contributed to the formation of secondary $MnWO_4$. To eliminate this, it is expedient to carry out rapid-cooling strengthening of products, which ensures the stabilization of high-temperature water-soluble phases of sodium and potassium tungstates. The introduction of SiO_2, Al_2O_3 and $FeMoO_4$ into the composition of a mixture of iron and manganese wolframites reduced (1073-1173 K) the degree of transition of the latter to tungstates. The smaller activity of K_2CO_3 to these additives allowed to reduce the excess K_2CO_3 to 20% against 60% with Na_2CO_3 for complete conversion to a water-soluble tungstate. It was shown that the use of K_2CO_3 in the sintering of wolframite concentrates was effective with a large amount of SiO_2 in the basic material.

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