

Liquid immiscibility in the system NaF–H₂O at 1073 K and 170–230 MPa and its effect on the microlite solubility

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Solutions of P-Q type in the field of fluid immiscibility at high T - P parameters are of interest as solvents of ore components because they form a couple of phases L_1 и L_2 , which essentially differ in salt content and the dissolving ability in respect of ore components. This phenomenon can play an important role in the mobilization processes of poorly soluble ore components from magmatic melts. Of particular interest is aqueous solution of sodium fluoride of P-Q type which has the critical point at $T > 973$ K and $P \approx 200$ MPa. Experimental studies of microlite $(\text{CaNa})\text{Ta}_2\text{O}_6\text{F}$ solubility were carried out in the system NaF–H₂O of P-Q type in a wide range of sodium fluoride concentrations (from 0 to 40 wt.% NaF). Tantalum concentration in equilibrium with microlite and fluorite in the concentrations range of NaF from 0 to 8 mol·kg⁻¹ H₂O (25 wt. % NaF) does not exceed 3×10^{-5} mol·kg⁻¹. Sodium fluoride concentrations have been estimated in immiscible fluids L_1 (fluid of moderate density) and L_2 (dense fluid) in the system NaF–H₂O at 1073 K and 200–230 MPa. The L_1 and L_2 fluids contain 2 ± 1 and 11 ± 2 wt.% NaF at $p = 170$ MPa, 5 ± 1 and 26 ± 1 wt.% NaF at $p = 200$ MPa, and 12 ± 1 and 25 ± 1 wt.% NaF at $p = 230$ MPa. The thermodynamic calculations indicate that predominant Ta species in the homogenous field of NaF–H₂O solutions in equilibrium with microlite and fluorite are HTaO_3° , $\text{TaO}_2\text{F}^\circ$, and $\text{Na}_6\text{H}_2\text{Ta}_6\text{O}_{19}^\circ$.

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