Composition and Viscosity of a Ternary Eutectic Na + K + Cs in the Vapor Phase

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The equilibrium composition and dynamic viscosity of saturated and superheated vapors of the sodium-potassium-cesium eutectic Na + K + Cs have been calculated in the range of temperatures 800-1500 K and pressures 10^3 - $8 \cdot 10^5$ Pa. The gas mixture was considered as consisting of 9 species: atoms of Na, K, Cs and diatomic molecules of sodium, potassium and cesium and diatomic molecules of NaK, NaCs and KCs. The equilibrium composition of the mixture has been determined by solving a system of six Van't Hoff's equations for dissociation reaction of diatomic molecules and two equations reflecting Raoult's low. Dalton's law has been used as the ninth equation of the system. The dynamic viscosity has been calculated on the basis of the kinetic theory of ideal gases. The collision cross-sections of interacting atom-atoms and atom-molecules necessary for calculating the dynamic viscosity have been determined on the basis of generalized experimental data for the viscosity of sodium, potassium and cesium vapors. The others collision-sections of atoms and molecules were determined with the aid of combination rules. The accuracy of the calculated viscosities is estimated to be within 4-5%.