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Statistical model of impurity atoms diffusion in the crystal lattice of metals and its application for calculating the diffusion coefficients of hydrogen and carbon atoms in iron

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A simple statistical model of the diffusion of impurity atoms in the crystal lattice of metals has been developed. The relationship between the diffusion flux of atoms and the gradient of their chemical potential is obtained from the basic principles of statistical thermodynamics. For an ideal solid solution of a substance atoms in a metal, an expression is found for the zero diffusion coefficient, which depends on the square of the temperature. The calculated diffusion coefficients of hydrogen and carbon atoms in iron are in a fairly good agreement with the known experimental data.

Keywords: metals, impurity centers.