EMPIRICAL ESTIMATIONS OF SURFACE TENSION OF GRAIN BOUNDARIES IN PURE SUBSTANCES

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In the framework of the model that treats grain boundaries as a homogeneous liquid-like layer in a solid matrix, empirical equations are obtained describing the temperature dependences of the average surface tension of high-angle grain boundaries in pure substances. The proposed expressions relate the surface tension of grain boundaries with the melting point, enthalpy of melting and the molar volume of pure elements in the solid state at the melting point. On their basis empirical expressions connecting the surface tension of the grain boundaries with the surface tension of the elements in the solid and liquid states at the melting point are also obtained. The proposed empirical relationships can be useful for quantifying of the average surface tension of high-angle grain boundaries in elementary solids at a not too low homologous temperature. Parameters of temperature dependences of the average surface tension of high-angle grain boundaries in 57 elements are given. The estimated error in determining of the values of the surface tension of the grain boundaries is comparable with the errors of their experimental determination.