Surface Energies of Metals in Both Liquid And Solid States

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Abstract

Although during the last years one has seen a number of systematic studies of the surface energies of metals, the aim and the scientific meaning of this research is to establish a simple and a straightforward theoretical model to calculate accurately the mechanical and the thermodynamic properties of metal surfaces due to their important application in materials processes and in the understanding of a wide range of surface phenomena. Through extensive theoretical calculations of the surface tension of most of the liquid metals, we found that the fraction of broken bonds in liquid metals (*f*) is constant which is equal to 0.287. Using the estimated *f* value, the surface tension (γ_m), surface energy (γ_{SV}), surface excess entropy ($-d\gamma/dT$), surface excess enthalpy (*Hs*), coefficient of thermal expansion (α_m and α_b), sound velocity (c_m) and its temperature coefficient ($-dc/dT$) have been calculated for more than sixty metals. The results of the calculated quantities agree well with available experimental data.