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Interfacial segregation and embrittlement of elements of groups 14 and 15 in ferritic iron and steels

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The experimentally determined data-enthalpy and entropy of the grain boundary segregation of substitutional solutes of 14th and 15th groups of the periodic table, i.e., silicon, phosphorus, tin and antimony, in α-iron are compared. The consequences of the grain boundary segregation of these elements for the inter-granular strengthening or embrittlement are also shown and discussed from the point of view of the values of the segregation enthalpy and entropy. It is documented that all these solutes except silicon segregate at the grain boundaries interstitially at enhanced temperatures although substitutional segregation is preferred at zero K. It is shown that this controversy can be explained on basis of so called enthalpy-entropy compensation effect. Despite some variations, the values of the strengthening/embrittling Gibbs energy of all solutes are nearly linearly dependent on the differences in the sublimation energies of the host and solute.

Biography

Pavel Lejcek has completed his PhD from Academy of Sciences of the Czech Republic. He has obtained the Alexander-von-Humboldt Research Award in 1989 at the Max-Planc-Institute for Metals Research, Stuttgart, Germany. He is presently a Senior Scientist at the Institute of Physics, Academy of Sciences of the Czech Republic and Professor at the University of Chemistry and Technology in Prague, Czech Republic. He has published more than 200 original papers and reviews in reputed journals and has been serving as an Editorial Board Member of repute. He is also author of the book *Grain Boundary Segregation in Metals*.

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