

Correlation Between Resistivity and Thermal Deformation of Cu-Zn Solid Solutions and Electronic Combinations

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A simple expression is presented which defines a direct connection between phonon electric resistance of normal metals and product of volumetric thermal expansion coefficient on temperature from the lowest temperatures up to melting temperature. This expression is validated within the phenomenological theory of condensed media. The present paper provides a check of the existence of such connection for alloys using an example of brasses. Alloys on the basis of copper and zinc form a number of the limited firm solid solutions and electronic connections. Results of experimental investigations in situ of electrical resistance and thermal expansion coefficient of alfa, alfa plus beta, beta, beta plus gamma, gamma, gamma plus epsilon and epsilon phases in the temperature range from 300 K to close to melting temperature are given. It is found that the electrical resistivity of these alloys also is proportional to the thermodynamic complex which is a product of the thermal expansion coefficient on temperature in both ordered and disordered phases. Maximum permissible electrical resistances for each of phases of these alloys are estimated. It is shown that a functional correlation exists between the order parameter and the thermodynamic complex for ordered phases.