# Mean Square Amplitudes of vibration and Associated Debye temperatures of $Cu_{1-x}$-$Zn_x$ alloys

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## Abstract

$Cu_{1-x}$ $Zn_x$ alloys with different compositions (x = 79.20, 82.00, 84.30, 86.10, 97.10, 97.50, 98.10, 98.60, 99.50) were prepared from spectroscopically pure Cu and Zn metals by melting appropriate quantities in evacuated quartz tubes. During the process of melting the mixture was thoroughly stirred for homogenization. The final compositions have been arrived at after subjecting these alloys to spectroscopic analysis. The powder samples of all the alloys were obtained by gently filing the ingots with jeweller's file. The directional mean square amplitudes of vibration Debye-Waller factor and associated Debye temperatures of hexagonal $Cu_{1-x}$-$Zn_x$ alloys have been obtained from X- ray integrated intensities. The integrated intensities have been measured with a Philips 3020 powder diffractometer fitted with a proportional counter using filtered CuKα radiation at room temperature and have been corrected for thermal diffuse scattering. Within the limits of experimental errors, the anisotropy observed in these parameters is negligible. The experimental values of directional Debye temperature have been compared with the values of Debye temoerature calculated from Kopp-Neumann relation. Vacancy formation energies of $Cu_{1-x}$-$Zn_x$ alloys have been estimated using a relation connecting it with the X-ray Debye temperature.