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X-Ray Measurement of Order in the Beta-Prime Phases of Noble Metal Alloys. I. β' AuZn*

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Abstract

The long range order parameter of the β' AuZn alloy of the $L2_0$ -type structure has been measured by X-ray diffraction at temperatures ranging from 200°C to 650°C, the latter temperature being 75°C below the melting point T_m . Relative intensities of several $h00$ type reflections from single crystals have been measured using a counter diffractometer equipped with a high temperature attachment. It has been observed that the order parameter gradually decreases with rising temperature but appears to keep an appreciably high value at T_m . An abnormal increase in the lattice spacing has also been observed at about 550°C, which corresponds to the onset of an appreciable disordering detected by the intensity measurement. It is concluded that β' AuZn is a special type of ordered alloy and it would undergo a transition into the disordered alloy state, if it were not melted.

The root-mean-square displacement of atoms due to thermal vibration has been measured as a function of temperature. At room temperature the displacement is 0.125Å, 4.6% of the nearest neighbor distance, and increases to 0.255Å at 650°C.

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