An X-ray Investigation of Thermal Mean-Square Atomic Displacements in Magnesium, Cadmium and Mg₃Cd

WATANABE Yousuke, IWASAKI Hiroshi, OGAWA Shiro

Journal: Science reports of the Research Institutes, Tohoku University. Ser. A, Physics, chemistry and metallurgy

Volume: 23

Page Range: 142-142

Year: 1971

URL: http://hdl.handle.net/10097/27607
An X-ray Investigation of Thermal Mean-Square Atomic Displacements in Magnesium, Cadmium and Mg₃Cd*

Yousuke WATANABE, Hiroshi IWASAKI and Shiro OGAWA

The Research Institute for Iron, Steel and Other Metals

Abstract

Measurements have been made of integrated intensities of X-ray symmetrical reflections from single crystals of magnesium, cadmium and Mg₃Cd, kept at temperatures ranging from room temperature to about 90⁰K.

It is observed that the thermal mean-square atomic displacements along two directions, the one parallel to the hexagonal c-axis $\bar{u}_z^2$ and the other perpendicular to the c-axis $\bar{u}_x^2$, are nearly the same in Mg₃Cd, showing little anisotropy. The result suggests that thermal vibrational amplitudes in the alloy can not be a simple average of those in magnesium and cadmium. No appreciable difference is observed between the mean-square displacements of an ordered and an imperfectly ordered Mg₃Cd.

The mean-square atomic displacements is calculated for magnesium and cadmium applying Zener’s theory of thermal vibration in hexagonal crystals and is compared with the observed displacements.

Discussions are given on the correlation between $\bar{u}_z^2/\bar{u}_x^2$ and the axial ratio, $c/a$, of hexagonal close-packed metals and also on the thermal mean-square displacements in alloys.

* The 1532th report of the Research Institute for Iron, Steel and Other Metals. Published in the Japanese Journal of Applied Physics, 10 (1971), 786.