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Close Packed Structures with Long Period Modulations of Stacking Sequence and Atomic Order in Au-Cd Alloys*

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Abstract

Au-Cd alloys in the range between 25 and 34 at. per cent Cd have been investigated by electron and X-ray diffraction as well as by calorimetry. The existence of a series of close packed structures with periodic stacking modulations and atomic order has been established. The order of appearance of the stacking variants is 4H (ABAC)—6H (ABABAC)—9R (ABCBCACAB)—2H(AB) with increasing Cd contents. The last two of these variants have the modifications with regard to the atomic arrangement on the close packed planes, i.e., the order-disorder transformation takes place with increasing temperature, but the stacking sequence of the close packed planes remains unchanged during the atomic disordering. The ordered arrangement on the close packed planes of the 9R type is identical with that of the one-dimensional long period superstructure with the $M=2$ type of the Au$_4$Cd alloy. The origin of the stabilization of the stacking variants with or without atomic order is briefly discussed.