Ba-Eu (Barium-Europium)

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The Ba-Eu phase diagram shown in [Massalski2] was redrawn from [88Gsc], who accepted the work of [78Zuk]. [78Zuk] obtained five data points by DTA. Although the experimental procedure was not mentioned explicitly in [78Zuk], it is likely that these points were obtained on heating, representing the solidus boundary. Because the melting points of Ba and Eu assumed by [78Zuk] were 710 and 826 °C, respectively, rather than the currently accepted 727 and 822 °C [Massalski2], the data of [78Zuk] are corrected linearly in Fig. 1. In the diagram of [88Gsc], the data point at 80 at.% Eu belongs to the liquidus, whereas other points belong to the solidus. Accordingly, the opening angles between the liquidus and solidus near pure Ba and pure Eu were too wide according to the criteria given in [91Oka2]. To eliminate this problem, phase boundaries are calculated here based on a simple thermodynamic model.

In the present thermodynamic modeling, the liquid is assumed to be an ideal solution (this assumption does not influence much the calculated phase diagram [91Oka1]). The separation between the liquidus and the solidus is very narrow, as expected, irrespective of the assumed thermodynamic functions for the solid phase. The solid phase boundaries were obtained using the thermodynamic functions given in Table 1. The data points of [78Zuk] are approximately represented by this model. For comparison, phase boundaries are shown with dashed lines for the case in which the solid phase is also an ideal mixture.

Cited References

78Zuk: M.A. Zukhuritdinov, A.V. Vakhobov, and T.D. Dzhurayev, *Izv. Akad. Nauk SSSR, Met.*, (2) 225-226 (1978) in Russian; TR: *Russ. Metall.*, (2), 179-180 (1978).

88Gsc: K.A. Gschneidner, Jr. and F.W. Calderwood, *Bull. Alloy Phase Diagrams*, *9*(3), 218-219 (1988).

91Oka1: H. Okamoto, *J. Phase Equilibria*, *12*(6), 623-644 (1991).

91Oka2: H. Okamoto and T.B. Massalski, *J. Phase Equilibria*, *12*(2), 148-168 (1991).

Table 1 Thermodynamic Model of the Ba-Eu System

Lattice stability parameter, J/mol

G^0 (Ba,L) = 0
G^0 (Eu,L) = 0
G^0 (Ba,bcc) = –7120 + 7.119T
G^0 (Eu,bcc) = –9210 + 8.410T

Excess Gibbs energy of mixing

$\Delta_{mix}G^{ex}(L) = 0$
$\Delta_{mix}G^{ex}(bcc) = 500X(1-X)$

Note: T is temperature in K. X is atomic fraction of Eu.

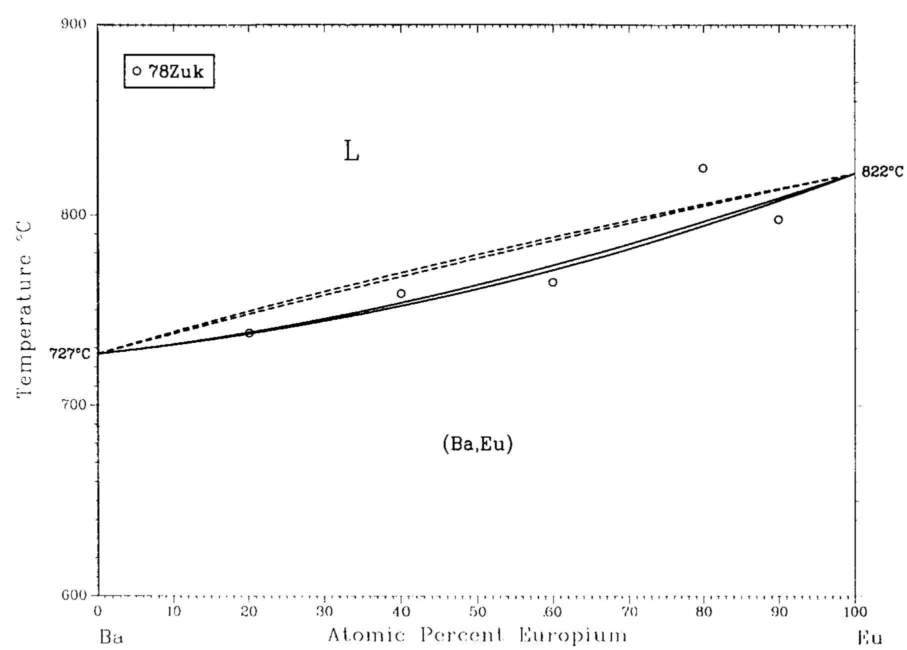

Fig. 1 Ba-Eu phase diagram.