Comment on Rh-Ru  
(Rhodium-Ruthenium)

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The Rh-Ru phase diagram in [Massalski2] (solid and dashed lines in Fig. 1) was redrawn from [84Pas]. [93Gur] derived thermodynamic parameters (Table 1) from this phase diagram. A calculated diagram, shown with dotted lines in Fig. 1, reproduced the experimental diagram closely.

However, a further study may be needed due to the following. First, according to the semiempirical estimation by [83Nie], the $\Delta_{\text{mix}}H(L)$ value of the Rh-Ru system must be approximately $+5000X(1-X)$ J/mol. In addition, $\Delta_{\text{mix}}S_{\alpha}(L)$ must be a small value of approximately $0.1 \Delta_{\text{mix}}H(L) [1/T_m(\text{Rh}) + 1/T_m(\text{Ru})]$ [90Tan]. Therefore, the Rh-Ru liquid is expected to be close to a regular solution with $\Delta_{\text{mix}}G_{\alpha}(L) \approx 5000X(1-X)$ J/mol, which is quite different from the value in Table 1. Second, the Gibbs energy of the cph/fcc transformation of Ru assumed by [93Gur] was $17,570 + 5.86T$ J/mol, whereas [83Swa] obtained a substantially different value, $866 + 3.01T$ J/mol, from the Fe-Ru phase diagram. Third, the existence of the (Rh) + (Ru) two-phase field with a constant width and nearly at the same location, as proposed by [84Pas], is rather unlikely. Usually, the width of a two-phase field becomes narrower at higher temperatures [93Oka]. The boundary may be shifted toward one direction, probably toward (Rh), as expected from an ideal solution model. The experimental phase diagram data shown in Fig. 1 have ample room for modification.

Cited References