

Mixing Enthalpies of TbBr₃-MBr Liquid Mixtures

(M = Li, Na, K, Rb, Cs)

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Z. Naturforsch. **56 a**, 859–864 (2001); received November 14, 2001

The molar enthalpies of mixing, $\Delta_{\text{mix}}H_{\text{m}}$ in the binary liquid systems TbBr₃-MBr (M = Li, Na, K, Rb, Cs) have been measured with a Calvet-type high-temperature microcalorimeter over the entire composition range with an accuracy of about 6%. Mixing of the two liquid components was achieved by using the “break-off ampoule” technique. All the investigated systems show negative enthalpies of mixing with a minimum value of approximately –1.25, –8.3, –17.0, –20.0 and –22.5 kJ mol^{–1}, for M = Li, Na, K, Rb and Cs, respectively. The mixing enthalpy in the TbBr₃-LiBr system is positive in the TbBr₃-rich region. For all the systems, the enthalpy minimum occurs at mole fraction $x_{\text{TbBr}_3} \approx 0.3 - 0.4$. The molar enthalpies of formation $\Delta_{\text{form}}H_{\text{m}}$ (3MBr, TbBr₃, l) for M = Li, Na, K, Rb and Cs at 1113 K (arising from the reaction $3\text{MBr}_{(\text{l})} + \text{TbBr}_{3(\text{l})} = (3\text{MBr}, \text{TbBr}_3)_{(\text{l})}$) are found to be –4.8, –31.3, –63.3, –70.3 and –81.2 kJ mol^{–1}, respectively. The least-squares coefficients *A*, *B*, *C*, *D* and *E* in the equation λ (kJ mol^{–1}) = *A* + *Bx* + *Cx*² + *Dx*³ + *Ex*⁴, where λ is an interaction parameter and $x = x_{\text{TbBr}_3}$, are also reported.

Key words: Terbium Bromide; Alkali Bromides; Mixing Enthalpy; Formation Enthalpy.