ISOTHERMAL SECTION OF THE PHASE DIAGRAM OF THE TERNARY SYSTEM Sm–B–Ga AT 600 °C

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The isothermal section of the phase diagram of the ternary system Sm–B–Ga at 600 °C was constructed in the whole concentration range by means of X-ray diffraction.

Samples for the investigation were synthesized from the elements (≥ 99.8 mass%) by arc-melting under purified argon atmosphere, annealed at 600°C in quartz ampoules for 720 h under vacuum, and subsequently quenched into cold water. Phase and structure analyses were performed using X-ray powder diffraction data collected on a diffractometer DRON-2.0M (Fe *Kα*-radiation, angular range $20^\circ \le 2\theta \le 140^\circ$, step 0.05º). The crystallographic and profile parameters were refined by the Rietveld method, using the program package FullProf Suite [1].

The existence of 9 binary compounds at 600ºC was confirmed in the boundary systems Sm–Ga and Sm–B: $SmGa_2$ (structure type AlB_2), SmGa (TlI), Sm_3Ga_2 (Gd_3Ga_2), Sm_5Ga_4 (Sm_5Ge_4), Sm_9Ga_4 (own structure type), SmB_{66} (YB_{66}), SmB_6 (CaB_6), SmB_4 (UB_4), and Sm_2B_5 (Gd_2B_5). The binary compounds do not dissolve noticeable amounts of the third component. Similar behavior was observed for the compounds in the binary systems; all the compounds have point compositions, except the phase $SmGa_{2+x}$, which displays a certain homogeneity range in the phase diagram (66.7–80.0 at.% Ga at 600 °C).

The isothermal section of the phase diagram of the ternary system Sm–B–Ga at 600 °C (Fig.) contains 12 single-phase, 21 two-phase and 10 three-phase fields. The largest number of equilibria (7) are formed by the binary phase SmB_4. No ternary compounds were observed in the system at 600 °C.

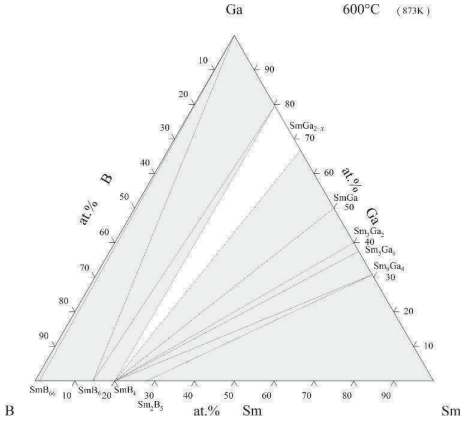

Fig. Isothermal section of the phase diagram of the ternary system Sm–B–Ga at 600 °C

[1] J. Rodríguez-Carvajal, Commission on Powder Diffraction (IUCr), Newsletter 26 (2001) 12-19.