Some Recent Results on $EuBr_2$-MBr Binary Systems

S. Gadzuric[a,c], L. Rycerz[b], E. Ingier-Stocka[b] and M. Gaune-Escard[c]

[a, c] *Faculty of Natural Science, Department of Chemistry, University of Novi Sad, Trg. D. Obradovica 3, 21000 Novi Sad, Serbia and Montenegro, e-mail: gadzuric@ih.ns.ac.yu*

[b] *Institute of Inorganic Chemistry and Metallurgy of Rare Elements, Wroclaw University of Technology, Wybrzeze Wyspianskiego 27, 50-370 Wroclaw, Poland*

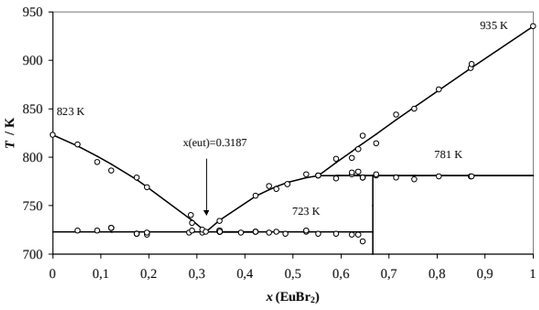
[c] *Ecole Polytechnique, Mecanique Energetique, Technopôle de Château-Gombert, 5 rue Enrico Fermi, 13453 Marseille Cedex 13, France*

Lanthanides are fairly used in a number of applications such as lanthanide or lanthanide alloys production [1], recycling of spent nuclear fuel [2-7], waste processing, lighting industry [8-10] etc. Many industrial processes, that are molten salt-based, involve rare earth halides, their mixtures with alkali halides.

The present work focuses on the thermodynamic properties of europium(II) bromide-alkali bromide melts. By opposition to most of the lanthanide compounds [11] which correspond to the valence state (III), europium is one of the few rare earth metal, together with samarium and ytterbium, that forms stable compounds in the valence state (II). Following previous results on the thermodynamic [12-13] and transport properties [14] of $EuCl_2$-based melts, we present here recent results on the phase diagrams and electrical conductivity measurements for europium(II) bromide-alkali bromide melts.

Phase equilibrium in the $EuBr_2$-MBr systems (M=Li, Na, K, Rb and Cs) was investigated by Differential Scanning Calorimetry, from which some intriguing features were evidenced. Unexpectedly, $EuBr_2$-NaBr represents a typical example of simple eutectic system, although lanthanide halides form generally stoichiometric compounds with sodium halides [15-19]

The phase diagram of the mixture with lithium bromide exhibits a eutectic and the $LiEu_2Br_5$ stoichiometric compound that melts incongruently.



In the systems with KBr, RbBr and CsBr the formation of several compounds was detected. The composition of all eutectic mixtures was accurately determined by the Tamman method [20].

The electrical conductivity of the same liquid binary $EuBr_2$-MBr mixtures was measured as a function of temperature over the whole composition range. The specific conductivity data of the liquid phase were fitted by a quadratic function of the temperature. Some electrical conductivity measurements, performed on both liquid and solid range, confirmed the formation of the compounds in these systems. The electrical conductivity data of the liquid phase were well fitted by Arrhenius equation and discussed in terms of possible complex formation.

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