

DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

The Ge-Li, In-Li and Ge-In-Li systems are among those which have not been thoroughly studied experimentally in terms of the transition temperatures and formation enthalpies of the intermetallic phases and the activity of the components in the solid and liquid solutions. Thus, no optimization has been carried out of the thermodynamic properties based on the experimental data, and the calculated equilibrium lines have not been created (phase diagrams), even for the two-component systems.

Therefore, the aim of the project is complementation of the missing thermodynamic data for the binary systems, as well as their optimization and determination of the phase diagrams. Furthermore, to initiate tests for the ternary Ge-In-Li system, measurements of the thermodynamic properties of the liquid phase and the calculations, based on their values, of the ternary interaction parameters have also been proposed. In this manner, the relationship between the excess Gibbs energy as a function of temperature and the concentration of the components will be worked out, which, in the future, will be used to calculate the ternary Ge-In-Li phase diagram.

To achieve the presented aim, the following investigations will be conducted:

- Activity measurements of lithium in solid and liquid solutions Ge-In and In-Li, as well as in liquid ternary solutions Ge-In-Li, by the concentration cell electromotive force measuring method.
- Preparation of the intermetallic phases and their structural analysis with the use of X-ray to ensure that the calorimetric measurements will be made for the phases with the assumed concentration and structure.
- Measurement of the formation enthalpy of the phases of binary systems and the mixing enthalpy of liquid solutions of Ge-In-Li with the use of the calorimetric method.
- Research of the melting and transformation temperature of intermetallic phases by the microcalorimetric method.
- Optimization of the experimental data, description of the thermodynamics relation of the phases and calculation of the phase diagrams of the binary systems Ge-Li and In-Li with the use of professional programs, ThermoCalc or Pandat.
- Calculation of the ternary interaction parameters of the germanium-indium-lithium liquid solutions.

The scope of research presented for realization will make it possible to develop relationships describing the thermodynamics of the phases of the Ge-Li and In-Li systems, to calculate their equilibrium phase diagrams as well as to develop an equation describing the thermodynamic properties of the liquid Ge-In-Li solutions based on the Muggianu model with the ternary interaction parameters.