Controlled mechanochemical synthesis. Relating chemistry to crystal structures

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Among the systems RE–Fe–In (RE – rare earths) the isostructural sections are built only for the Er–Fe–In [1] and partially for the Pr–Fe–In systems. The indide PrFe3In (ST NdFe3Si, SG I4/mcm, a = 8.105 Å, c = 23.527 Å) [2] was found in the Pr–Fe–In system. The other RE–Fe–In (RE = Nd, Sm) systems have been investigated in order to find isotypic REFe3In indides.

The aim of this investigation is construction of the isostructural sections of {Tb, Dy}–Fe–In systems at 600°C and study crystal structure of the ternary compounds which are forming. Samples for investigation were prepared by arc-melting of pure metals under an argon atmosphere. Homogeneous annealing was performed at a temperature 600 °C during 720 hour and after that the alloys were quenched in cold water.

We confirmed the existence of all binary compounds which limit the investigated ternary systems: REIn, REIn2, REIn3, REFe, REFe2, REFe3, REFe2, (RE = Tb, Dy).

New compound TbFe3In2 was found in the Tb–Fe–In system.

Keywords: RE–Fe–In, RE, Fe, In, solid-state chemistry.