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Dy-Mn-Si as a representative of family of ‘Dy-Transition Metal-Si’ systems: its isothermal sections, empirical rules and new rare-earth manganese silicides

A. V. Morozkin^{a*}, A.V. Knotko^a, V.O. Yapakurt^b, A. Provino^c, P. Manfrinetti^c, Jinlei Yao^d, Fang Yuan^d, Y. Mozharivskyj^d

^a *Department of Chemistry, Moscow State University, Leninskie Gory, House 1, Building 3, Moscow, GSP-2, 119992, Russia*

^b *Department of Petrology, Geological Faculty, Moscow State University, Leninskie Gory, Moscow, 119992, Russia*

^c *INFM and Dipartimento di Chimica e Chimica Industriale, Universita' di Genova, Via Dodecaneso 31, 16146 Genova, Italy*

^d *Department of Chemistry and Chemical Biology, McMaster University, 1280 Main Street West, Hamilton, Ontario, L8S 4M1, Canada*

E-mail: morozkin@general.chem.msu.ru

Abstract

X-ray and microprobe analyses were employed for the investigation of Dy-Mn-Si system at 870/1070/1170 K. The Dy-Mn-Si system, contains the known DyMn₂Si₂, DyMnSi and Dy₂Mn₃Si₅ compounds and DyMn₄Si₂, Dy₂MnSi₂ and Dy₃Mn₂Si₃ were new compounds identified first time and their structure are of the type TmCu₄Sb₂, Sc₂CoSi₂ and Hf₃Ni₂Si₃ respectively. The quasi-binary solid solutions were detected at 870/1070/1170 K: the ThMn₁₂-type Dy₈Mn₈₇Si₅, Th₆Mn₂₃-type Dy₂₃Mn₇₂Si₅, MgCu₂-type Dy₃₃Mn₅₈Si₉ and AlB₂-type Dy₃₈Mn₂Si₅₈. The other binary compounds of the Dy-Mn-Si system do not show any visible solubility.

New phases R₂MnSi₂ and R₃Mn₂Si₃ (R = Gd, Tb, Ho – Tm) were found out and their structure of the type Sc₂CoSi₂ and Hf₃Ni₂Si₃ respectively.

The specific features of ‘Dy – Transition Metal – Si’ systems were discussed.

Keywords: Phase diagram; Rare-earth compounds; Crystal structure

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