

Molten Gallium as a Non-Reactive Solvent: Synthesis of the Silicides $RE_2Ni_{3+x}Si_{5-x}$ (RE = Sm, Gd and Tb)

Marina A. Zhuravleva and Mercouri G. Kanatzidis

Department of Chemistry, Michigan State University, East Lansing, MI, 48824

Reprint requests to Prof. Dr. M. G. Kanatzidis. E-mail: kanatzid@cem.msu.edu

Z. Naturforsch. **58b**, 649–657 (2003); received February 25, 2003

The use of molten Ga as a non-reactive solvent for the synthesis of intermetallic silicides was demonstrated on the family $RE_2Ni_{3+x}Si_{5-x}$ ($RE = \text{Sm, Gd and Tb}$). The structure of $\text{Sm}_2\text{Ni}_{3+x}\text{Si}_{5-x}$ was solved from single crystal X-ray data in the orthorhombic space group $Ibam$, $Z = 4$, cell parameters $a = 9.6396(12)$; $b = 11.3219(14)$; and $c = 5.6967(13)$ Å. The refinement based on the full-matrix least-squares on F_o^2 [$I > 2\sigma(I)$] converged to final residuals $R_1/wR_2 = 0.0206/0.0492$. The structure of $RE_2Ni_{3+x}Si_{5-x}$ is related to the $\text{U}_2\text{Co}_3\text{Si}_5$ structure type; however, discrepancies exist between the solution obtained for $RE_2Ni_{3+x}Si_{5-x}$ and that reported for $\text{U}_2\text{Co}_3\text{Si}_5$. The magnetic properties studied on $\text{Tb}_2\text{Ni}_{3+x}\text{Si}_{5-x}$ indicate an antiferromagnetic ordering of magnetic moments centered at Tb ions at 13 K, and Curie-Weiss behavior at high temperatures with the effective moment close to that of free Tb^{3+} ion.

Key words: Flux Synthesis, Magnetism, Mixed Occupancy, Intermetallics