Neue Arsenide mit $ThCr_2Si_2$- oder einer damit verwandten Struktur: Die Verbindungen ARh_2As_2 (A: Eu, Sr, Ba) und $BaZn_2As_2$

New Arsenides with $ThCr_2Si_2$-type or Related Structures: The Compounds ARh_2As_2 (A: Eu, Sr, Ba) and $BaZn_2As_2$

Andrea Hellmann, Anke Löhken, Andreas Wurth und Albrecht Mewis

Institut für Anorganische Chemie und Strukturchemie II, Heinrich-Heine-Universität, Universitätsstraße 1, D-40225 Düsseldorf, Germany

Sonderdruckanforderungen an Prof. Dr. A. Mewis. E-mail: Albrecht.Mewis@uni-duesseldorf.de

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Four new arsenides of rhodium and zinc were prepared by heating mixtures of the elements at high temperatures (1000 – 1200 °C) and investigated by single crystal X-ray methods. $EuRh_2As_2$ (a = 4.067(1), c = 11.319(2) Å) and $BaRh_2As_2$ (a = 4.053(1), c = 12.770(3) Å) crystallize with the well-known $ThCr_2Si_2$-type ($I4/mmm$; Z = 2). Due to the rigid layers of $RhAs_4$ tetrahedra, and to the atomic size of europium and barium, the As–As distances between the layers with values of 2.97 and 3.66 Å, respectively, are very long. $SrRh_2As_2$ is polymorphic and undergoes two phase transitions at about 190 and 282 °C. Main features of the three crystal structures are also layers of $RhAs_4$ tetrahedra. At room temperature α-$SrRh_2As_2$ (a = 5.676(1), b = 6.178(2), c = 11.052(2) Å) probably crystallizes with the $BaNi_2Si_2$-type ($Cmcm$; Z = 4), whereas β-$SrRh_2As_2$ (a = 5.760(3), b = 6.067(4), c = 11.264(5) Å, $Fmmm$, Z = 4) forms a new orthorhombically distorted variant of the $ThCr_2Si_2$-type. Single crystals grown in a flux of lead and quenched at high temperature show that the γ-phase (a = 4.112(1), c = 11.431(6) Å) crystallizes with the $ThCr_2Si_2$-type. The same is true for the high temperature modification of $BaZn_2As_2$ (β-phase; a = 4.120(1), c = 13.578(1) Å), whereas the already known α-$BaZn_2As_2$ forms the α-$BaCu_2S_2$-type ($Pnma$; Z = 4) consisting of a 3D-network of edge- and vertex-sharing $ZnAs_4$ tetrahedra with Ba atoms in the voids of this network.

Key words: Arsenide, Europium, Alkaline Earth Metal, Rhodium, Zinc, Crystal Structures