

Neue gemischte Sr/Ba-Trielide $A^{\text{II}}\text{In}_x\text{M}_{1-x}^{\text{III}}$ ($M = \text{Ga}, \text{Al}$)

New Mixed Sr/Ba Trielides $A^{\text{II}}\text{In}_x\text{M}_{1-x}^{\text{III}}$ ($M = \text{Ga}, \text{Al}$)

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A series of new ternary mixed Sr and Ba trielides of overall composition 1 : 1 was synthesized from stoichiometric quantities of the elements. The structures of the new compounds were determined using single crystal X-ray data. In the case of the Sr compounds, commensurately modulated new superstructures of the CrB type are formed in the In-rich part of the ternary system SrAl – SrGa – SrIn: The gallides, $\text{SrIn}_{1-x}\text{Ga}_x$ ($x = 0.30$, orthorhombic, space group *Ima2*, $a = 1954.2(7)$, $b = 1305.6(4)$, $c = 1272.6(3)$ pm, $Z = 48$, $R1 = 0.0848$) are formed in the composition range $x = 0.20$ to 0.30 . The closely related aluminide $\text{SrIn}_{1-x}\text{Al}_x$ ($x = 0.04$, orthorhombic, space group *Pnna*, $a = 1280.1(7)$, $b = 1482.0(5)$, $c = 1308.7(5)$ pm, $Z = 36$, $R1 = 0.1164$) and the isotypic Zn compound $\text{SrIn}_{0.90}\text{Zn}_{0.10}$ ($a = 1277.7(4)$, $b = 1489.9(3)$, $c = 1301.3(4)$ pm, $R1 = 0.0629$) also contain mainly In as the triele element. The structures, similar to CrB, contain zig-zag chains of two-bonded In-Ga/Al, in which the ordering of the trieles results in a strong wavelike form of the originally planar zig-zag chains. In contrast, no corresponding Ba compounds were formed. Instead, $\text{BaIn}_{0.46}\text{Ga}_{0.54}$ (triclinic, space group $P\bar{1}$, $a = 661.1(3)$, $b = 679.4(2)$, $c = 712.4(3)$ pm, $\alpha = 69.13(3)$, $\beta = 77.14(3)$, $\gamma = 84.27(3)^\circ$, $Z = 2$, $R1 = 0.0557$) crystallizes with a new structure type and exhibits a planar rhomb-like anion with both two- and three-bonded In/Ga atoms. Attempts to obtain 1 : 1 compounds in-between BaAl and BaIn resulted in the formation of the 5 : 6 phases $\text{Ba}_5\text{In}_{6-x}\text{Al}_x$ ($x = 4.1/5.1$, hexagonal, space group $P\bar{6}m2$, $a = 612.2(4)/608.6(1)$, $c = 1124.6(10)/1116.80(6)$ pm, $Z = 1$, $R1 = 0.0608/0.0147$) which are isotypic to $\text{Ba}_5\text{M}_5^{\text{III}}\text{M}^{\text{IV}}$ ($M^{\text{III}} = \text{Al}, \text{Ge}$; $M^{\text{IV}} = \text{Sn}, \text{Pb}$). Their structures contain isolated In anions (coordinated by 11 Ba atoms) and sheets of 3- and 4-bonded Al/In atoms similar to those known from the structures of Ba aluminides like Ba_3Al_5 .

Key words: Indium, Gallium, Aluminium, Trielides