
The 21st International Conference on Solid Compounds of Transition Elements



March 25 - 29, 2018

Programme and Abstracts



Mo-PO9

Novel ternary gallides of the structural family $\text{Ce}_{2+n}\text{Rh}_{3+3n}\text{Ga}_{1+2n}$ ($n=0\div6$)*Victoriya Avzuragova¹, Sergey Nesterenko¹, Anna Tursina¹¹Department of Chemistry, 1/3, Leninskie Gory, Moscow State University, Moscow, 119991 Russia

The direct alloying of cerium, rhodium, and gallium results in the formation of intermetallic compounds with sequence of related structures, forming a new homologous series. Structures of 9 ternary intermetallic compounds of Ce-Rh-Ga system containing 50 at.% of rhodium were determined from single-crystal X-ray diffractometer data. The compounds are built up of columns of alternating combination of the fragments of $\text{Ce}_2\text{Rh}_3\text{Ga}$ with $\text{Mg}_2\text{Cu}_3\text{Si}$ structure (MgZn_2 -type) or $\text{Mg}_2\text{Ni}_3\text{Si}$ (MgCu_2 -type) and fragments of CeRh_3Ga_2 with CeCo_3B_2 structure (CaCu_5 -type), forming the homologous series $\text{R}_{2+n}\text{T}_{3+3n}\text{M}_{1+2n}$ ($n=0\div6$). They can be grouped in two different structural series: trigonal ($R\bar{3}m$) and hexagonal ($P6_3/mmc$) group, depending on Laves-type fragment.

n=0	$\text{Ce}_2\text{Rh}_3\text{Ga}$	$R\bar{3}m$	$Z=3$	$a=5.614(2)$	$c=11.932(5)$
n=1	CeRh_2Ga	$P6_3/mmc$	6	$a=5.556(3)$	$c=15.680(8)$
n=2	$\text{Ce}_4\text{Rh}_9\text{Ga}_5$	$R\bar{3}m$	3	$a=5.554(3)$	$c=34.98(2)$
n=3	trig - $\text{Ce}_5\text{Rh}_{12}\text{Ga}_7$	$R\bar{3}m$	3	$a=5.563(4)$	$c=46.36(6)$
	hex - $\text{Ce}_5\text{Rh}_{12}\text{Ga}_7$	$P6_3/mmc$	2	$a=5.597(3)$	$c=31.40(3)$
n=4	trig - $\text{Ce}_2\text{Rh}_5\text{Ga}_3$	$R\bar{3}m$	3	$a=5.5743(8)$	$c=57.82(2)$
	hex - $\text{Ce}_2\text{Rh}_5\text{Ga}_3$	$P6_3/mmc$	6	$a=5.5923(12)$	$c=38.116(10)$
n=5	$\text{Ce}_7\text{Rh}_{18}\text{Ga}_{11}$	$R\bar{3}m$	3	$a=5.583(2)$	$c=69.35(3)$
n=6	$\text{Ce}_8\text{Rh}_{23}\text{Ga}_{11}$	$R\bar{3}m$	3	$a=5.571(3)$	$c=80.53(3)$

* The work was performed under support of Ministry of Education and Science of Russia, Contract N16.552.11.7081 and RFBR (research Grant No. 15-03-04434).

Mo-PO10

Novel ternary aluminide $\text{Ce}_4\text{Ru}_3\text{Al}_2$ *E.V. Marushina¹, D. Kaczorowski², E.V. Murashova, A.V. Gribov¹¹Department of Chemistry, Lomonosov Moscow State University, 119991 Moscow, Russia²Institute of Low Temperature and Structure Research, Polish Academy of Sciences, 50-950 Wrocław, Poland

The crystal structure of a novel ternary intermetallic aluminide $\text{Ce}_4\text{Ru}_3\text{Al}_2$ was determined from the synchrotron X-ray powder diffraction data collected on an almost single-phase alloy. The compound crystallizes with an orthorhombic structure of new type: space group $Pnma$, lattice parameters $a = 22.0592(5)$, $b = 4.62213(6)$, $c = 7.54309(8)$ Å, $Z = 4$. It can be presented as packing of coupled trigonal prisms with Ru-atoms located inside the prisms and quadrilaterals Ru_2Al_2 residing in between them. The new structure is closely related to those of the equiatomic germanides YbAuGe and CaCuGe [1-2], which have similar atomic order with a total of nine crystallographic sites of the same multiplicity. However, while in the germanides, each type of atoms occupies three sites, in $\text{Ce}_4\text{Ru}_3\text{Al}_2$, Ce atoms are distributed over four sites, Ru atoms occupy three sites, and Al atoms are located at two sites. A remarkable feature of $\text{Ce}_4\text{Ru}_3\text{Al}_2$ is extremely small values of some Ce-Ru distances, ranging from 2.300(1) to 2.572(1) Å. Only one of the four inequivalent Ce atom exhibits a regular distance from its nearest neighbors, exceeding 3.235(1) Å. In concert with the structural characteristics, $\text{Ce}_4\text{Ru}_3\text{Al}_2$ was established by means of low-temperature magnetic and electrical transport measurements to exhibit a coexistence of valence fluctuations and local moment magnetism, attributable to the Ce atom sublattices with anomalously short and normal Ce-Ru interatomic distances, respectively. Due to the $\frac{1}{4}$ fraction of Ce^{3+} ions with fairly stable $4f^1$ electronic configuration, $\text{Ce}_4\text{Ru}_3\text{Al}_2$ orders antiferromagnetically at $T_N = 2$ K and shows Kondo behavior in its electrical resistivity. In this respect, the novel aluminide resembles the gallide $\text{Ce}_9\text{Ru}_4\text{Ga}_5$ that also bears in its crystallographic unit cell Ce ions with diverse valence states [3].

*This work was supported by RFBR under research grant no. 18-03-00477a.

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