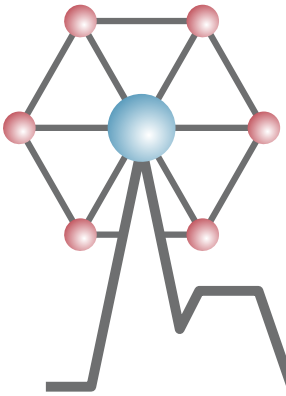
The 21st International Conference on Solid Compounds of Transition Elements



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Programme and Abstracts

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Mo-PO7

*C*s-corrected STEM Observation for Al-Rh-Cu Decagonal Quasicrystal

Kunio Yubuta [1] , Akira Yasuhara [2] , Kazuki Yamamoto [3] , Kenji Hiraga [1]

[1] *Institute for Materials Research, Tohoku University, Sendai 980-8577, Japan*

[2] *EM Application Group, EM Business Unit, JEOL Ltd., Tokyo 196-8558, Japan*

[3] *Department of Physics, Nara Women's University, Nara 630-8506, Japan*

On the basis of *C*s-corrected high-angle annular detector dark-field (HAADF)- and annular bright-field (ABF)-scanning transmission electron microscopy (STEM) observation, the structure of an Al-Rh-Cu decagonal quasicrystal (DQC) formed with two quasiperiodic planes along the periodic axis in an annealed $Al_{63}Rh_{18.5}Cu_{18.5}$ alloy has been investigated. Heavy atoms of Rh, and mixed sites (MSs) of Al and Cu atoms projected along the periodic axis can be clearly recognized as separate bright dots in HAADF-STEM images, and consequently arrangements of Rh atoms and MSs on the two quasiperiodic planes can be directly determined from those of bright dots in HAADF-STEM images. The Rh atoms are arranged in pentagonal tiling formed with pentagonal and star-shaped pentagonal tiles with an edge-length of 0.76 nm, and also MSs with a pentagonal arrangement are located in the pentagonal tiles with definite orientations. The star-shaped pentagonal tiles in the pentagonal tiling are arranged in τ^2(τ: golden ratio)-inflated pentagonal tiling with a bond-length of 2 nm. From arrangements of Rh atoms located in pentagonal tilings with a bond-length of 2 nm, which are generated by the projection of a hyper-cubic lattice in a five-dimensional superspace, occupation domains in the perpendicular space are derived. Al atoms as well as Rh atoms and MSs are represented as dark dots in ABF-STEM images. The present model of the Al–Rh–Cu DQC is basically different from the structure proposed by single crystal X-ray diffraction in respect of the presence of the 0.76 nm pentagonal tiling of Rh atoms and MSs of Al and Cu atoms.

Mo-PO8

The crystal structure of two novel cage-like aluminides *

Sergey Nesterenko [1] , Anna Tursina [1] , Victoriya Avzuragova [1]

[1] *Department of Chemistry, 1/3, Leninskie Gory, Moscow State University, Moscow, 119991 Russia*

Two novel intermetallic compounds from Al-rich region of the Ce-Rh-Al phase diagram were synthesized using arc-melting technique. The crystal structure of $Ce_2Rh_3Al_{14}$ was analyzed by means of powder X-ray diffraction and Rietveld analysis. In the case of $Ce_3Rh_7Al_{29}$, structure determination was performed using single-crystal X-ray diffraction data. Single crystals were selected from crashed polycrystalline ingots.

The compound $Ce_3Rh_7Al_{29}$ of the new structure type crystallizes in orthorhombic space group (SG) *Cmcm,* Pearson symbol *oC*156 with a=9.1570(4), b=31.3790(14), c=8.9414 (17) Å, V=2569.2(17) Å^3. Intermetallics $Ce_2Rh_3Al_{14}$ has a tetragonal structure closely related to $Ce_2Ru_3Al_{15}$†, SG $I4_1/amd$, Pearson symbol *tI*136, a=9.0000(15), c=31.7640(11) Å), V=2572.9(6) Å^3. Three cerium atoms (4c site) in $Ce_3Rh_7Al_{29}$ and two cerium atom (8e site) in $Ce_2Rh_3Al_{14}$ are coordinated by 18 and 20 Rh and Al atoms, forming the 3D- frameworks of large icosahedral voids. This feature resembles the high coordinated Ce environment seen in $CeRh_4Al_{15.7}$ and $CeRh_2Al_{10}$. With the exception of the disordered Ce1 in $Ce_3Rh_7Al_{29}$, the closest Ce-Ce contacts in both compounds are about 4.5 Å.

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† Tursina A.I., Nesterenko S.N., Murashova E.V., Chernyshev I.V., Noel H., Seropegin Y.D. (2004), Acta Crystallogr. E 60, i145-i146.

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