

Poster Sessions

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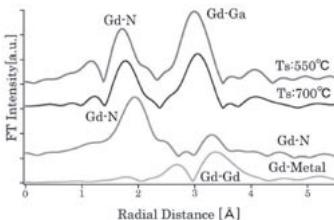
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Crystal growth condition dependence of local structure around Gd in GaN nanotods

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III-V semiconductors doped rear earth elements are attractive materials as magnetic semiconductors. They have high potential for applications in spin-depended photonic and spintronics devices because of room temperature ferromagnetic behaviors. Here, we examine nanorods of GaGdN because nanorods are much better than film from crystallization and ferromagnetic points of view. Gd doped GaN nanorods were grown on naturally oxidized surfaces of Si (001) by radio-frequency plasma assisted molecular beam epitaxy. The substrate temperatures were set at 823K and 973K and Gd Cell temperature at 1373K. In order to study the local structure around Gd atoms in GaGdN nanorods, we observed XAFS spectra. Fig. 1 represents the radius structure functions (RSF) of GaGdN nanorods, which are analyzed from XAFS spectra. GdN and Gd-metal spectra are inserted in Figure 1 to compare GaGdN nanorod spectra. The peak, which is observed at 0.18 nm, corresponds to the Gd-N bond distance and at 0.31 nm corresponds to the Gd-Ga bond distance. Obviously, the RSFs of GaGdN are different from those of GdN and Gd-metal as shown in Fig. 1. Therefore, Gd ions are substituted at the Ga lattice points in GaGaN nanorods.



Keywords: diluted magnetic semiconductors, XAFS, rare earth element

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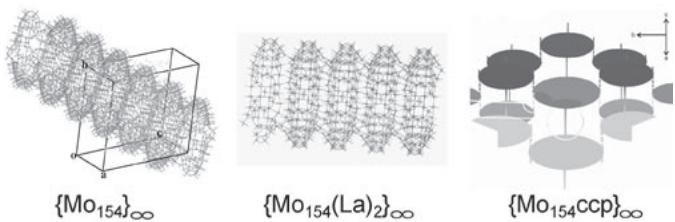
Photoinduced self-assembly to tube, chain, and other aggregate of molybdenum-blue nano-rings

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The prolonged photolysis of aqueous solutions containing $[Mo_{36}O_{112}(H_2O)_{16}]^{8-}\{Mo_{36}\}$ and electron donors at pH=1 with or without lanthanide ions (Ln^{3+}) led to the formation of a variety of aggregates of the car-tire-shaped Mo-blue nano-rings with outer and inner ring-diameters of 3.5 and 2.2 nm, and 1.1-nm thickness. Structures of tube, $[Mo^{V}_{28}Mo^{VI}_{126}O_{446}(OH)_{12}(H_2O)_{66}]^{8-}\{Mo_{154}\}$, chain, $[MoV_{28}MoVI_{118}O_{424}(OH)_{20}(H_2O)_{60}\{Ln(H_2O)_5\}_2]^{10-}\{Mo_{146}Ln_2\}$ ($Ln = La, Er$), and cubic-close-packing (ccp)-like aggregate, $[MoV_{28}MoVI_{126}O_{424}(OH)_{40}(H_2O)_{62}]^{16-}\{Mo_{154}ccp\}$, were x-ray crystallographically characterized. The motif of the Mo-O-Mo linkage between inner rings in neighboring ring molecules is different among three structures: four *head-to-linker* and two *linker-to-linker* linkages for $\{Mo_{154}\}$, two *linker-to-edge* for $\{Mo_{146}(Ln)_2\}$, and two *linker-to-linker* for $\{Mo_{154}ccp\}$. The incorporation of Ln^{3+} in the inner ring of $\{Mo_{146}Ln_2\}$ suggests that Ln^{3+} is involved in the dehydrative condensation between inner rings of Mo-blues to yield aggregates

which let us expect promising properties in the nanostructure landscape for material science.



Keywords: photoinduced self-assembly, nano-tube and -chain, molybdenum-blue nanorings

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On the nature of crystal growth units

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The problem of how the crystals grow, was, in general, solved by mid part of the past century. However, debates about the nature of the building units at crystals growing continue hitherto. The key ideas are the following: 1. The crystals grow by joining separate atoms (ions) or molecules. 2. The building units at crystals growing are separate crystalline blocks. In principal, realization of these two extreme variants does not disagree with the general laws of physics and chemistry. In fact, majority of the modern theoretical models of the crystals growing is modeled on their base. With that, another idea – on the building units as particles of larger ones, than separate atoms (molecules), but not being crystalline particles - has already long been discussed and finds all more pieces of experimental verification. The most spreading ideas are: 1. On non-Kossel crystal growth (L.N.Rashkovich et al.). 2. On aggregation of crystals from polyhedral structural units (G.D.Ilyushin et al.). 3. On specific pre-crystallization nano-clusters of “hidden” phase (quatarons) as of basic units of the growth (A.M.Askhabov). Each of these new ideas, solving one and the same problem - on the nature of the building units - differently, turned out to be exceedingly fruitful for making clear the mechanism of real crystal formation. As a result we have to revise a number of the outdated ideas on the crystal growth. In the presentation the basic ideas on the quataron mechanism of the crystal growth are discussed and comparative analysis of the specified above new ideas on the nature of the building units, the mechanism of their formation, the forms of existence and their role in the process of growth are given. This study was supported by RFBR (08-05-00346a) and Scientific School (3266.2008.5).

Keywords: crystal growth, growth units, nano-clusters

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Polymorphism below room temperature

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The crystals of new polymorphic modifications of some common

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