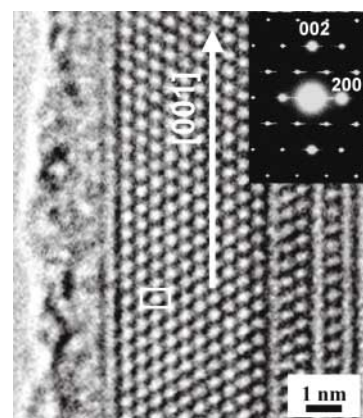
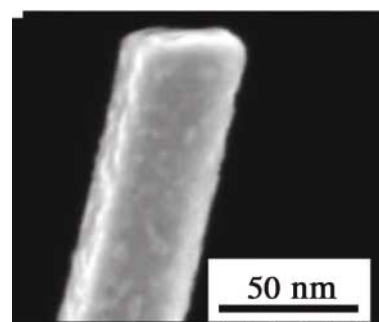


Preparation of Boron Nano-Cluster Solids

- A challenge to the novel functional materials using nano-cluster solids -

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AIST Today Vol. 3, No. 3
(2003) 16

Nano-cluster solid materials show unique physical properties depending on the cluster structure and are considered as new functional materials. For example, doped boron crystals are expected to be a high T_c superconductor. We have succeeded in the preparation of a boron nano-cluster solids with a belt-like shape by a low vacuum PLD method. The boron nano-belt shows a tetragonal single crystal structure that is unstable for the bulk without impurities.



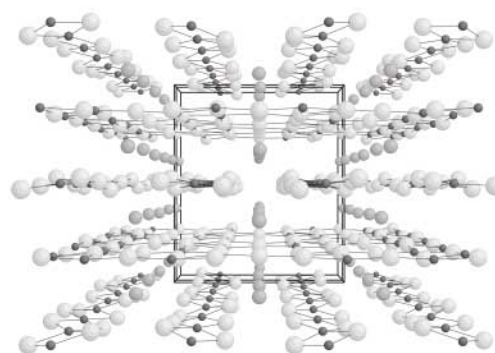
"SEM image showing belt-like shape (a) and HRTEM image with a inset of electron diffraction pattern. (b) for a boron nano-cluster solid."

Role of the Atomic Modulations in Aperiodic Composite Crystal

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AIST Today Vol. 3, No. 3
(2003) 17

Recently, advanced materials with unusual electronic and/or magnetic properties have been desired. Aperiodic crystals with long range ordered atomic arrangements, for example, present interesting structural properties for the functional materials above mentioned. Especially, in the composite crystals with plural substructures, a variety of interesting properties for superconductors or thermoelectric materials have been observed because there are mutual lattice modulations between the substructures. The (3+1)-dimensional superspace group symmetry is the most convenient method to describe the modulated structures of aperiodic crystals. By the use of the superspace group approach, the mechanism of hole transfer

in $(\text{Sr}_2\text{Cu}_2\text{O}_5)_{0.70}\text{CuO}_2$, " $\text{Sr}_{14}\text{Cu}_{24}\text{O}_{41}$ " has been investigated.



Modulated composite structure of $(\text{Sr}_2\text{Cu}_2\text{O}_5)_{0.70}\text{CuO}_2$, " $\text{Sr}_{14}\text{Cu}_{24}\text{O}_{41}$ ".