

(3) STRUCTURE OF A 2/1 APPROXIMANT IN THE Al-Pd-Mn-Si SYSTEM (One-day Symposium on Quasicrystals)(Miscellany)

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(3) STRUCTURE OF A 2/1 APPROXIMANT
IN THE Al-Pd-Mn-Si SYSTEM

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The structure of icosahedral phases has been discussed on the basis of icosahedral atom clusters found in the crystal structures of Al_{12}Mn ($a = 0.8$ nm) and α - AlMnSi ($a = 1.2$ nm). Recently, a cubic approximant ($a = 2.0$ nm) has been found in the Al-Pd-Mn-Si system, and larger icosahedral clusters are expected to be found in its structure. The purpose of this study is to analyze the structures of the cubic AlPdMnSi phase by means of single crystal X-ray diffraction and to discuss atomic arrangement. The structure of cubic $\text{Al}_{69.5}\text{Pd}_{23.0}\text{Mn}_{6.2}\text{Si}_{1.3}$ was determined by means of single crystal X-ray structural analysis: space group $Pm\bar{3}$, $a = 20.211(2)\text{\AA}$, $\text{Mo } K\alpha$; refined as $\text{Al}_{69.6}\text{Pd}_{24.4}\text{Mn}_{6.0}$, $R(wR2) = 0.0662(0.1744)$ for 2275 reflections with $I > 1.5s(I)$. The icosahedral cluster with about 20\AA in diameter is found to locate at the origin of a unit cell. The atomic arrangement of the cluster can be described as nine atomic shells with icosahedral symmetry and some atomic shells are similar to those of Bergman and Mackay icosahedral clusters. The present cluster is suggested to be one of the basic structural units for the icosahedral quasicrystals in the Al-Pd-Mn-Si system.

(4) MATERIALS CHARACTERIZATION
BY TEM AT IAMP

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In this talk, I would like to outline the research of atomic scale morphology analysis lab. First I will talk about characterization of monodispersed particles by TEM. By using ultramicrotomy, we obtained thin sections of the particles. With these thin sections, we could clarify the internal structure of the particles on atomic scale with high-voltage TEM. Secondly I would like to talk about the development of quantitative high-resolution TEM with a new recording system, i.e., imaging plates. Characteristics of the imaging plates, such as DQE (detective quantum efficiency), signal to noise ratio (S/N) were evaluated. Taking account of these characteristics of the imaging plates, we could carry out the quantitative analysis. In the analysis, a residual index between the observed and calculated images were evaluated. The smallest residual index 0.0304 was obtained for high-resolution TEM images of WO_3 block structure. I will also talk about the construction of the database of TEM images, i.e., "EMILIA : Electron Microscope Image Library and Archive". It will be pointed out that digital data of TEM images will be exchanged and shared through the internet.