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Crystal structure and phase transition in copper(II) trans-1,4-cyclohexane dicarbonate and toluene-absorbed copper(II) trans-1,4-cyclohexane dicarbonate

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1. Introduction

Microporus materials attracted much attention because of their potential technological applications to gas storage, molecular sieve, and so on. A series of copper dicarbonate complexes have recently been synthesized, and the peculiar properties have been studied extensively. The structure of copper(II) trans-1,4-cyclohexane dicarbonate (CCD) is characterized by one-dimensional nano-size tunnels, which are formed with stacked square lattices of $Cu_2(OOC\text{-}C_6H_{10}\text{-}COO)$. We have measured the heat capacity of CCD by adiabatic calorimetry, and found a board heat capacity anomaly about 180 K, which can be assigned to a first-order phase transition. In the present study, we studied the phase transition behavior of the powder sample and the mechanism is discussed from the structural aspect.

2. Experimental

The sample of CCD and toluene-absorbed CCD was synthesized as reported elsewhere. The powdered samples were sealed in a glass capiraly of 0.3mm inner-diameter. The X-ray powder diffraction patterns were collected at several temperatures from 100 K to 300 K by the large Debye-Scherrer camera at BL02B2. The wavelength of used X-ray was 0.85 Å.

3. Results

Figure 1 shows the powder patterns of CCD without toluene-absorbed. The diffraction pattern obviously changes between 200 and 220 K due to the phase transition reported previously. Further detailed analysis of the structure of each phase using Rietveld analysis and the studies of the mechanism of the phase transition are in progress.

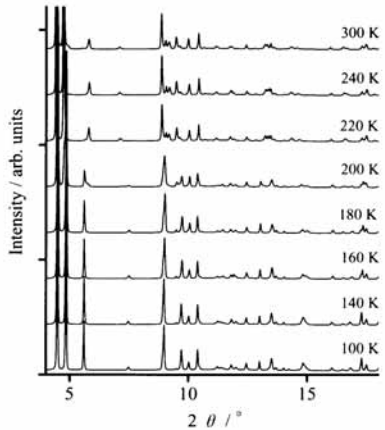

Fig.1. Powder X-ray patterns of CCD.

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Structural analyses of IV[th] group nano cluster solids grown on the gate insulators

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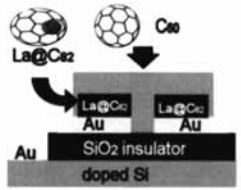
Electronic devices comprising of organic materials are currently being pursued with a surge of interests. Under such circumstances, we have investigated the relationship between the C_{60} thin film structure and the field effect transistor (FET) properties using a low-glancing-angle X-ray diffraction (XRD) method.[1] One of the most important issues in these devices is the efficiency of carrier injection from the source electrode to organic semiconductor thin films. The aims of this study are to see how efficiently electron carries can be injected to the C_{60} thin films when endohedral fullerenes are used as an interface layer.

Thin film samples were prepared by high vacuum deposition methods. XRD measurements with a large Debye-Scherrer camera at the beam-line BL02B2 of SPring-8 were performed using the X ray wavelength λ = 1Å and its incident beam to the samples with the low-glancing angle of 2°

From the XRD data of C_{60} thin films grown on a $La@C_{82}$/Si substrate and a Si substrate, it is apparent that there is no large difference in the thin film structure since the XRD patterns were similar to each other. These results clearly indicate that the thin film growth of C_{60} is not very much influenced by whether the $La@C_{82}$ layer exists or not. In spite of the little change in the crystal structure of C_{60} thin films, the enhancement of the FET properties were observed when the inferfacial layer of $La@C_{82}$ exists between the Au electorode and the C_{60} thin film. Therefore, the quality of the interface contact between the electorode and the C_{60} thin film is improved by the existence of La@C82 interfacial layer.



[1] H. Ohashi et al., *Appl. Phys. Lett.*, **84**, 520 (2004).