

Single crystalline copper-phthalocyanine thin film grown on Au (001) buffer

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Organic molecule is one of the most promising materials for future spin-based devices. For instance, various kinds of phthalocyanine molecules including copper phthalocyanine (CuPc) have been investigated since its radical spin has relatively long spin coherent time. [1] However, existing molecular spin devices has poor quality as compared to inorganic devices such as an MgO-based magnetic tunnel junction, and this make it difficult to conduct further development in the molecular spintronics. To improve this, epitaxial growth and micro-fabrication are indispensable. In the present study, we have tried to conduct epitaxial growth of an organic molecule, CuPc.

Figure 1(a) shows the multilayer structure. The MgO(001)substrate/Cr (30 nm)/Au (2 nm)/CuPc (50 nm)/Au (30 nm) multilayer was fabricated by molecular beam epitaxy. During deposition of Cr, the substrate temperature was kept at 150 °C. The Cr layer was post annealed at 350 °C. Other layers were deposited at room temperature. Reflection high-energy electron diffraction (RHEED) observation during deposition was conducted *in-situ* at each layer. After growth, the multilayer was characterized *ex-situ* by x-ray diffraction (XRD) using a 0.154187 nm Cu K α x-ray. Figure 1(b) shows RHEED patters for the CuPc layer. The in-plane incident direction of the electron beam was parallel to the <100> direction of the Au (001) buffer. From Fig. 1(b), it is believed that a single crystalline CuPc with tetragonal symmetry was grown. Detailed crystal structure characterized by both RHEED and XRD will be discussed in the presentation.

This work was supported by Grant-in-Aid for Young Scientists (A) (No. 15H05420).

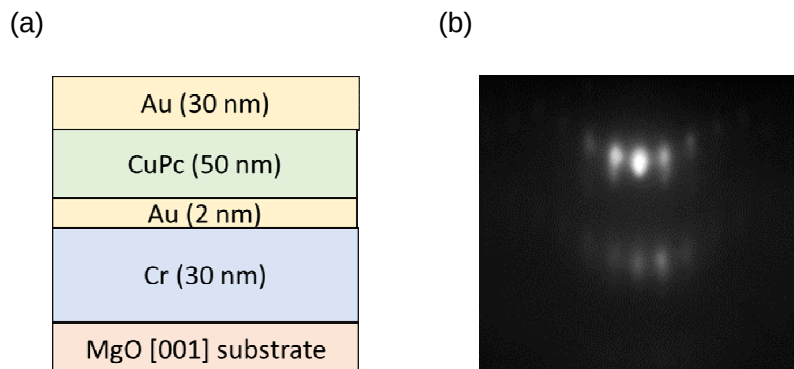


Figure 1 (a) Schematic of the multilayer
(b) RHEED image of the copper-phthalocyanine (CuPc) thin-film

[1] M. Warner *et al.*, Nature **503**, 504 (2013).