# Magnetic moments of Co-phthalocyanine grown on Fe(001)

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Magnetic ions in phthalocyanine molecules may show unique orbital magnetism because of its unquenched orbital angular momentum [1]. We have reported phthalocyanine molecules can epitaxially grow on metals with bcc crystal structure on MgO (001) substrate [2]. In this presentation, we report a characterization of magnetic moments of Co in Co-phthalocyanine (CoPc) on bcc-Fe (001) by x-ray absorption spectroscopy (XAS).

Figure 1 shows multilayer structure. The multilayer consist of MgO (001) substrate/MgO(5 nm)/V(30 nm)/Fe(0.5 nm)/Co phtharocyanine(0-0.85 nm)/MgO(2 nm), and it was fabricated by molecular beam epitaxy. All layers were deposited at room temperature. The V layer was post-annealed at 500 °C for 30 minutes. XAS and its x-ray magnetic circular dichroism (XMCD) were conducted at soft x-ray beamline, BL25SU, at SPring-8. Figure 2 shows XAS/XMCD spectra of 0.35-nm-Co-phthalocyanine. One monolayer thickness of the Co-phthalocyanine almost corresponds to 0.35 nm. The measurements were performed under perpendicular magnetic field of 1.9 T, where magnetization of the Fe saturated. From Fig. 2, negative XMCD at Co-$L_3$ edge (~778 eV) shows ferromagnetic coupling between magnetic moments of Fe and Co. In addition, XMCD intensity at Co-$L_3$ edge is much larger than that of Co-$L_2$ edge (~793 eV), indicating large unquenched orbital magnetic moment. In the presentation, magnetization direction and phthalocyanine thickness dependence of the magnetic moments will be discussed.

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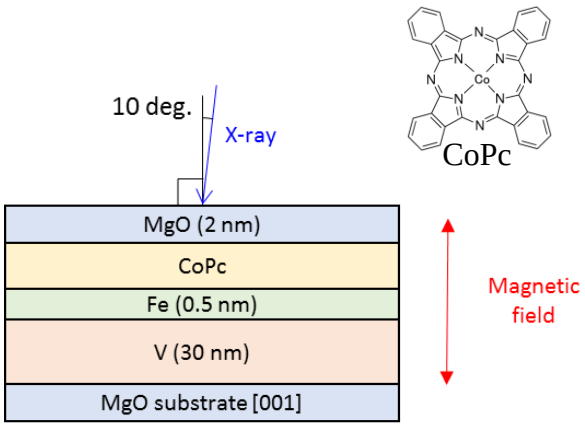


Fig. 1 Sample structure

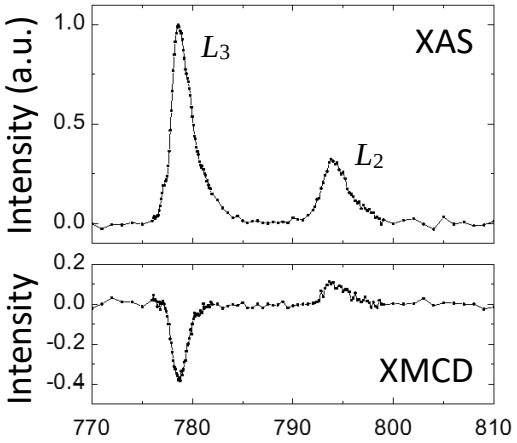


Fig. 2 XAS/XMCD spectra of Co $L_{2,3}$ edge

[1] J. Bartolomé *et al.*, Phys. Rev. B **81**, 195405 (2010).
[2] S. Miwa *et al.*, JSAP Autumn meeting 2015, 13p-PA1-20.