Structural and magnetic properties of DNTT, PTCDI-C8/$LaSrMnO_3$ bilayer

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Organic semiconductor is interested in connecting to spin-dependent electronics owing to their long spin relaxation time [(1)] and low spin-orbit interaction. [(2)] The organics itself can not be used as a spin source at room temperature (RT); therefore, the organic semiconductor needs to be in contact with magnetic materials. In this bilayer system, low damping magnetic materials and low mixing conductance at the interface are required. The $LaSrMnO_3$ (LSMO) epitaxial films exhibited very low damping constant in the in-plane direction at RT. [(3)] The oxide materials are surface stable in the atmospheric condition compared with metals; which can be an efficient spin source for organic semiconductors. In this study, the organic semiconductor materials of DNTT and PTCDI-C8 (t = 5 nm) was deposited on the LSMO epitaxial films (t = 70 nm) and systematically investigated structure and magnetic properties. Figure 1 show the XAS and XMCD spectrum. Superposition of Mn-L_3 was normalized isotropic XAS spectra. In the case of LSMO/PTCDI-C8 bilayer of XAS spectra, the Mn^{4+} at the interface was increased when deposited at 180°C which probably due to the electron-acceptor nature of PTCDI -C8. [(4, 5)] The PTCDI-C8 and DNTT deposited at RT is as same as that of LSMO w/o capping. The XMCD spectrum of PTCDI-C8 at 180°C showed decreases of Mn moments which is corresponding to decrease of Mn^{3+}. Thus, RT deposition for PTCDI-C8 and DNTT can expect for efficient spin injection or spin-dependent transport. We also present magnetic properties by M - H loops and structural analyses using synchrotron X-ray diffraction.

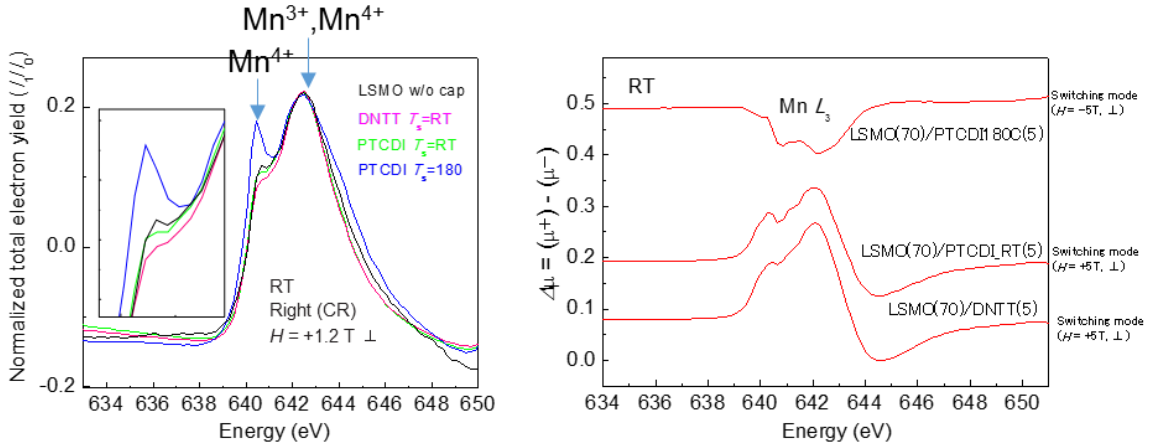

Figure 1 XAS and XMCD spectrum for $LaSrMnO_3$ and DNTT, PTCDI / $LaSrMnO_3$ bilayer.

References: [1] J. Tsurumi, *et al*., Nat. Phys., **13**, 994 (2017), [2] D. Sun *et al*., Nat. Mat., **15**, 863 (2016), [3] H. Naganuma *et al*., SSDM2018. [4] M. Galbiati, *et. al*., Appl. Sur. Sci. **353**, 24 (2015). [5] Chesterfield *et al*., J. Phys. Chem. B **108** 19281 (2004). **Acknowledgements:** This research was partially funded by Grant-in-Aid for Scientific Research (B) (No. 15H03548), and performed under the PF Program (No. 2018G017).