MATERIALS SCIENCE:

Spectroscopic studies in SPring-8 cover one of the most progressing research fields in materials science for the investigating of electronic and magnetic properties. Because relatively high energy photons with a high energy resolution are used for spectroscopy works, intrinsic bulk and buried interface properties are precisely investigated in these works. Hard-X-ray photoemission spectroscopy (at BL15XU, 29XU, 46XU and 47XU), so-called HAXPES, provides accurate bulk and interface information of materials. The report by Nagata and coworkers at BL15XU shows the results of a HAXPES study with bias voltage applied to the $Pt/HfO_2/Pt$ interface. This extends the field for investigating realistic devices under operating conditions. Tanaka and coworkers presented the mechanism of the tunable metal-insulator transition of VO_2 by HAXPES.

The activities of angle-resolved photoelectron spectroscopy in the soft-X-ray regime at SPring-8 (BL17SU, BL23SU and BL25SU) are also leading the field in materials science for the investigating of electronic structures, which give us bulk-sensitive information of band structures. Not only bulk-sensitive measurements, but also thin film studies have been performed. The spin-spiral nature of ultrathin Fe/Cu(001) films was investigated by Miyawaki *et al*. at BL17SU.

Electronic & Magnetic Properties

The investigation of the anisotropy of magnetic materials is very important, because the phenomenon is directly related to the exchange bias effect and perpendicular magnetization among others, which are applied in recording devices. In the present volume, several investigations concerning magnetic anisotropy are reported. Sakurai and coworkers measured the magnetic Compton profile of the Co/Pd and Co/Pt multilayer systems at BL08W and discussed the mechanism of perpendicular magnetization.

The anisotropic phonon state of the *c*-axis-aligned $L1_0$-FePt nanoparticles was investigated by ^{57}Fe nuclear resonant inelastic scattering at BL09XU by Tamada *et al*.

The similar $L1_0$ structure was found in an iron meteorite. Photoelectron emission microscopy observation for the Widmanstättenn structures in the meteorite was performed by Kotsugi *et al*., at BL25SU and BL39XU. They found out very strong anisotropy in the interface between the bcc- and fcc-FeNi structures, which corresponds to $L1_0$- FeNi.

PEEM observation is also performed on the antiferromagnetic materials. Arai and coworkers successfully determined the spin axes of each magnetic domain of NiO at BL17SU and BL25SU. This gives us fundamental knowledge of micro-antiferromagnetic structures.

Although the other activities based on other spectroscopic methods such as very high energy resolution inelastic X-ray scattering (IXS), magnetic circular dichroism in absorption spectroscopy (XMCD), and infrared spectroscopy are not introduced in this volume, the installation and setup of new apparatus are underway. It is expected that further challenges will produce a variety of activities. These show us the frontier of materials science.

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