

MATERIALS SCIENCE:



SPring-8 has a number of beamlines for spectroscopic and scattering experiments to investigate the electronic and magnetic structures of various kinds of materials in a wide photon energy range from the infrared (IR) to hard-X-ray region. Magnetic circular dichroism (MCD) in absorption spectroscopy in both soft-X-ray (BL23SU and BL25SU) and hard-X-ray (BL39XU) regions is utilized in magnetism studies. In this volume, two examples are introduced. Shiratsuchi shows the MCD results and explains the exchange bias mechanism of a Co/ α -Cr₂O₃ interface. He further introduces the possibility of isothermal switching of the spin directions in an antiferromagnetic substrate by applying high magnetic field pulses. Suzuki represents the intrinsic nature of Pauli paramagnetism in diamagnetic bulk gold. There are several beamlines available for magnetism studies by methods involving scattering such as Compton scattering (BL08W) and nuclear resonance (BL09XU). Recently, these beamlines have been used not only for studies of magnetism but also for studies of other types of electronic structures. Okada *et al.* introduce the study of the electronic properties of high-temperature liquid using high-energy inelastic X-ray scattering. They develop a levitation technique to hold a liquid sample stably.

ELECTRONIC & MAGNETIC PROPERTIES

At BL23SU, investigations to observe the irradiation effects on biosamples are performed. Oka *et al.* combine soft-X-ray absorption spectroscopy with electron paramagnetic resonance spectroscopy (EPR). During ionization irradiation of DNA molecules, they observe a post-collision interaction effect. This provides an important basis for understanding a novel mechanism of DNA damage.

Photoemission spectroscopy (PES; including angle-resolved PES) studies are widely performed at both the soft-X-ray (BL07LSU, BL17SU, BL23SU, BL25SU, and BL27SU) and hard X-ray (BL15XU, BL19XU, BL29XU, BL46XU, and BL47XU) beamlines. Bulk sensitive information on the electronic structures of matter is obtained. Recently, polarization dependences of hard-X-ray photoemission spectroscopy (HAXPES) have been observed in many cases. Both circularly and linearly polarized lights are utilized. Sekiyama *et al.* introduce the dependence for linearly polarized light in HAXPES for gold. They observe the orbital nature of $5d$ bands of gold. In 2009, the Synchrotron Radiation Research Organization in the University of Tokyo constructed a high brilliance soft X-ray beamline with 8 segments of parallel/perpendicular figure-8 undulators in the long straight section of BL07LSU at SPring-8. The aim of this beamline is to perform time-resolved spectroscopy, three-dimensional scanning photoelectron microscopy with a lateral resolution in the sub-100 nm range, ultrahigh-resolution soft X-ray emission spectroscopy, and other advanced spectroscopies. Matsuda introduces the first results of using this beamline. He measured the time evolution of surface photovoltage effects for semiconductor surfaces.

There are still important activities from other beamlines that could not be introduced in this volume. We are certain of further progress and activities in materials sciences.

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