Materials Science:

SPring-8 has a number of beamlines for spectroscopic and diffraction experiments to investigate the properties of various kinds of materials in a wide photon energy range from the infrared (IR) to the hard-X-ray region. Magnetic circular dichroism (MCD) and photoemission spectroscopy (PES; including angle-resolved PES) studies are the important methods both at the soft- and hard-X-ray beamlines. A new MCD method has been developed at BL25SU very recently. Matsui and coworkers presented the possibility of obtaining the layer-resolving magnetic information by diffraction spectroscopy technique combined with MCD. It is expected that this new method will be popular among many users. Conventional MCD measurement has an advantage in element-specific measurements and a high sensitivity for characterizing magnetic moments for dilute magnetic matter. BL23SU, BL25SU and BL39XU are mainly used for MCD studies. Activities concerning Fe nanowires and a dilute magnetic semiconductor are presented. Although there is no report of angle-resolved PES in this chapter; the activities are very high at BL17SU, BL23SU and BL25SU. A very precise observation of the metastable chemisorption state of oxygen on the Si surface is introduced as a representative study of PES in the soft-X-ray region here. The status of the hard X-ray photoemission spectroscopy (HAXPES) studies at SPring-8 is very high and is really in the frontier of science. HAXPES measurement is available at BL15XU, BL19XU, BL29XU, BL46XU and BL47XU. One can access information on really bulk-sensitive electronic structures very easily. Evidence of the recoil effect in the valence band region and the observation of buried interface electronic structures for a magnetic electronic-device material are introduced as hot topics in HAXPES studies.

ELECTRONIC & MAGNETIC PROPERTIES

Compton scattering experiment (at BL08W) is one of the studies complementary to neutron scattering or other magnetic probes for magnetism investigation. Combined with theoretical calculations, the magnetic information of the kagome staircase structure $Co_3V_2O_8$ is shown. Inelastic X-ray scattering (including resonant inelastic scattering; RIXS or resonant X-ray emission; RXES) is a very powerful technique with a high energy resolution in the hard-X-ray region. Here, we present information related to the phonons in the new Fe-based high-Tc superconductors (at BL35XU) and the pressure-induced valence anomaly in TmTe (at BL12XU).

IR microspectroscopy studies are underway at BL43IR. In this chapter, the imaging of the phase separation of the EuO ferromagnetic semiconductor and the effect of carrier doping by X-ray irradiation of organic materials are introduced.

We believe that these activities are really the research frontier of science and may play an important role in the progress of materials sciences.

Toyohiko Kinoshita