Material Science and Element Strategy Initiative at KEK-Photon Factory

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The Photon Factory (PF) is an accelerator-based light source facility, as a part of the Inter-University Research Institute Corporation, the High Energy Accelerator Research Organization (KEK). The PF consists of Synchrotron Radiation Science Division of the institute of Material Structure Science and Accelerator Division 7 of Accelerator Laboratory. The PF operates two storage rings: the 2.5-GeV PF Ring and the 6.5 GeV PF Advanced Ring (PF-AR). The PF ring was constructed as a second-generation synchrotron radiation source and the first photon came out in 1982. During the intervening 35 years, the PF underwent two large upgrades of the ring in 1988 and 1997 and the emittance was reduced to 36 nmrad. During the shutdown in 2005 the number of straight sections was increased from 10 to 14. In the long straight sections we have reconstructed Vacuum Ultra Violet (VUV)/Soft X-ray (SX) beamlines (BL-2, -13, -16, -28) with undulators in recent years. Meanwhile, we have upgraded the X-ray beamlines (BL-1, -3, -17) by installing short gap undulators in the short straight sections to gain long-term competitiveness in the field of X-ray science. The PF continuously supplies brilliant X-rays and VUV light, which provide the means to understand the function of materials and life.

The PF is participating in many national projects with the inclusion of Element Strategy Initiative. The PF is accepting many research projects from the four Core Research Centers. In particular the PF staff members join in the cooperative studies in Electronic Materials and Magnetic Materials Core Centers as principal investigators. We provide guidelines for the consideration of making new materials based on the crystal and electronic structures studies. For example, the Electronic Materials Core Center is pursuing electride materials with high mobility and low work function; we have succeeded to extend the material concept of the electride by studying the electronic structure and the local structure in operation of the catalytic function. In the research of ion based superconductors, we have used not only synchrotron radiation but also neutron and muon to elucidate the electronic and magnetic structures toward the complete understanding of the high-Tc superconductors (Fig.2). In this manner, many researchers of universities and industries are using the light of the PF as indispensable and daily tool.

Figure 1. 47 stations in operation at PF, PF-AR.

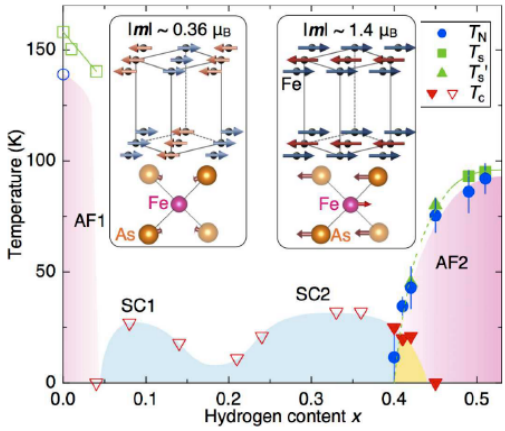

Figure 2. Phase diagram of $LaFeAsO_{1-x}H_x$

Bibliography

[1] M. Hiraishi; Nature Physics, **10**, 300 (2014).

External links

http://www2.kek.jp/imss/pf/