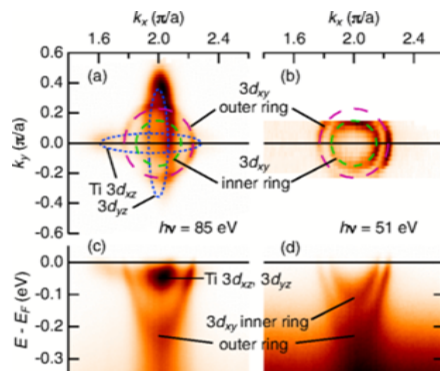


Announcement

Special issue of JSR: Diffraction limited storage rings – a window to the science of tomorrow

Using new concepts in magnet design, vacuum technology and an improved understanding of beam dynamics, light sources of unprecedented quality are being and will be built. The users have embraced this challenge and now design instrumentation to exploit this increased performance as well as experiments demanding it. In our common effort to make the invisible secrets of nature visible we have again come one step further. A recently published special issue by guest editors Mikael Eriksson and J. Friso van der Veen [J. Synchrotron Rad. 21, 837-1216 (2014)] provides a comprehensive review of the field with contributions from leading researchers and groups from around the world. SLS staff members have contributed to this issue with five articles, <http://www.iucr.org>.

Research highlight



A revealing mixture: The surface of an oxide insulator can host two distinct types of conducting electrons

N.C. Plumb et al, Physical Review Letters 113, 086801

(2014), <http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.113.086801>

A collaboration led by scientists at PSI used detailed high-resolution angle-resolved photoemission spectroscopy (ARPES) at the Surface/Interface

Spectroscopy (SIS) beamline in order to obtain the clearest view to date of the electronic structure of the metallic surface state on SrTiO₃. ARPES is a uniquely powerful technique for probing and visualizing electrons' energy and momentum states, which determine a material's most fundamental electronic properties. The experiments revealed that the surface's conducting electrons come in two basic forms that behave in drastically different ways. Those that are associated with titanium 3d_{xy} orbitals tend to be highly confined to a narrow surface region. Others associated with 3d_{xz} and 3d_{yz} orbitals occupy different energy levels from the 3d_{xy} electrons and penetrate several layers or more into the subsurface region. The ARPES data show that, in addition to their spatial segregation, these two types of electrons have different conducting properties – not only relative to each other, but also relative to how they would be expected to behave in the bulk of SrTiO₃. The study also found clues to how the surface state forms, including the relative influence of surface defects (against which the conducting electrons are highly robust) and other effects – perhaps structural – that more significantly alter the character of the valence electrons.