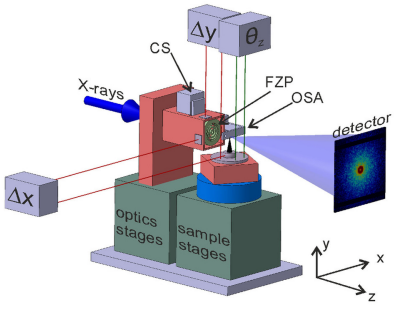
PAUL SCHERRER INSTITUT

PSI facilities newsletter

full version available from:
http://www.psi.ch/info/facility-news

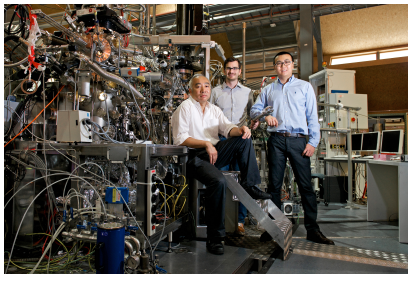
Announcement



Tomographic nano-imaging reaches 16 nm isotropic 3D resolution

OMNY (t**OM**ography **N**ano cr**Y**o stage) is an ongoing instrumentation project at the SLS implementing an endstation for tomographic nano-imaging at 10 nm resolution in 3D using ptychography. When complete, OMNY will image biomaterial and materials science samples at cryogenic temperatures in an ultra-high vacuum environment. Cryogenic sample fixation will permit measurements of biological samples such as soft tissue and entire cells close to their native state without chemical fixation. A prototype system called OMNI (tOMography Nano Imaging) operating at room temperature and atmospheric pressure has now reached a world record isotropic 3D resolution of 16 nm on a nanoporous test structure. OMNI routinely reaches 30 nm 3D resolution on many types of scientific samples that are radiation hard and is available to users at the cSAXS beamline. **More details:** http://dx.doi.org/10.1038/srep03857.

Research highlight



PSI scientists Ming Shi, Nicholas Plumb and Nan Xu (from left to right) at the SIS beamline at the SLS. Photo: Paul Scherrer Institute / Markus Fischer

Insulator makes electrons move in an ordered way

Novel material shows properties necessary for spintronic devices

***N. Xu et al, Nature Communications* 30 July 2014**
DOI: 10.1038/ncomms5566

The motion of electrons is at the heart of most electronic applications. However, in the quest for the next generation of devices, researchers are also interested in manipulating the electrons' spins – their traits that make them into tiny magnets. This new technology, called spintronics, has already found its way into electronic devices like hard drives and will lead to smaller and faster devices with unexpected functionalities in the future. Spintronics requires polarized electric currents with all the electron spins pointing in one direction. Researchers at the Paul Scherrer Institute (PSI), the Ecole Polytechnique Fédérale de Lausanne (EPFL), and the Institute of Physics (IOP) at the Chinese Academy of Sciences have now proven that the material SmB_6 shows all the properties of a so-called topological insulator – a material with currents of spin-polarized electrons flowing along its surface. In the bulk, away from the surface, the material is an insulator and does not allow any currents to flow. The polarized currents are a result of the insulating property inside, and these properties are directly interconnected; above a particular temperature where the sample becomes conducting, the spin-polarized currents vanish. SmB_6 is not the first topological insulator to be discovered, but in contrast to other materials, the insulating property is based on a special phenomenon that makes it very robust – the so-called Kondo effect. This effect ensures that the *only* current that can flow is spin-polarized, and this special property is not easily destroyed by small irregularities in the structure or composition of the material. **More details:** http://www.psi.ch/media/public-and-media.

Paul Scherrer Institut, 5232 Villigen PSI, Switzerland, useroffice@psi.ch, http://www.psi.ch