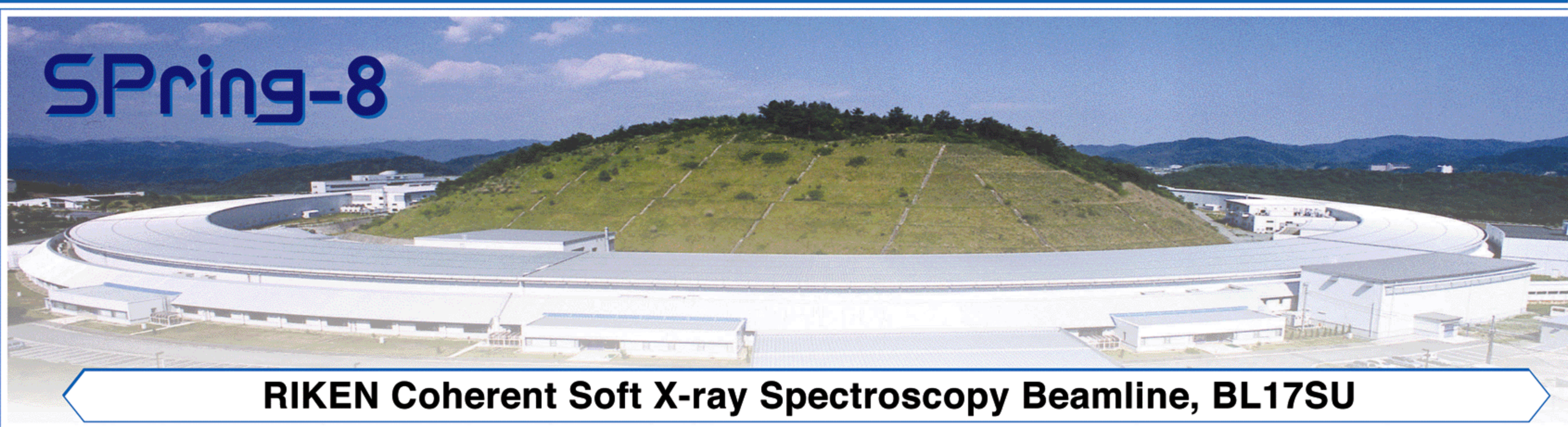

RIKEN Coherent Soft X-ray Spectroscopy Beamline, BL17SU

BL17SU is aimed at advancing spectroscopic studies mainly in solid state physics and materials science using high-brilliance soft X-ray undulator radiation. Photoabsorption, photoemission and soft X-ray emission spectroscopies are adopted to determine the electronic structures of various kinds of material. The branched beamlines (a and b), which can be switched by a premirror and used alternatively, are ready for use. The a-branch has four experimental stations (A1, A2, Ac, and A3), and the b-branch has two experimental stations (B1 and B2). A1: spectroscopic study of multiple charged ions, A2: high-resolution photoemission spectroscopy, Ac: small free space where users can bring in their own instruments, A3: soft X-ray emission spectroscopy for liquid and biological samples, B1: soft x-ray diffraction spectroscopy, B2: surface science.

X-rays probe crystal chirality

Enantiomers in many proteins, sugars and pharmaceuticals crystallize into two forms that are mirror images of each other - like our right and left hands. Polarised light typically changes its polarisation direction depending on whether it passes through a ‘left’ or ‘right’- handed form of an enantiomer, providing a convenient means to distinguish them. Unfortunately, conventional X-rays Bragg diffraction, a popular material analysis technique, cannot differentiate between the two. Dr. Y. Tanaka and collaborating scientists at the RIKEN SPring-8 Center in Harima and the UK have shown that right and left circularly polarised (RCP and LCP) X-rays of the right energy can distinguish ‘left’ from ‘right’ low quartz, whose crystal structures are shown in Fig. 1. The results show that "forbidden" reflection 001 is observed at the resonant energy of the Si K-edge (1.85 keV) and that the intensity depends on the crystal form (right- or left-handed) as shown in Fig. 2. This technique is expected to be useful for studying the chirality of other materials including biomaterials, liquid crystals and multiferroics.

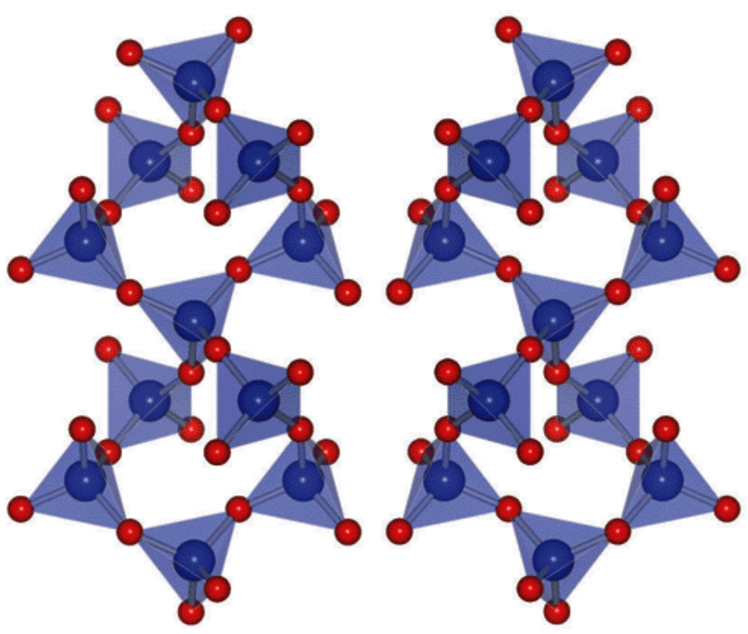

Fig. 1 Views of atomic structures of R-quartz (right) and L-quartz (left) along the a*- and b*- axes, respectively. Blue and red spheres represent Si and O atoms, respectively.

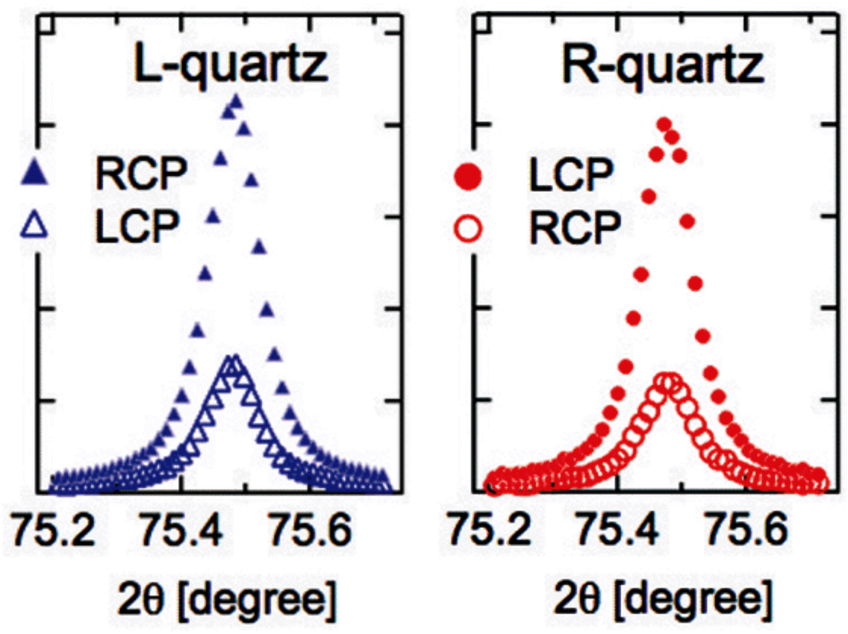

Fig. 2 Reflection profile of 001 of R-quartz and L-quartz measured with a left circular polarized (LCP) incident beam and a right circular polarized (RCP) incident beam.

References: Phys. Rev. Lett. **100**, 145502 (2008); Nature **452**, 917 (2008); Nature Photonics **2**, 331 (2008)