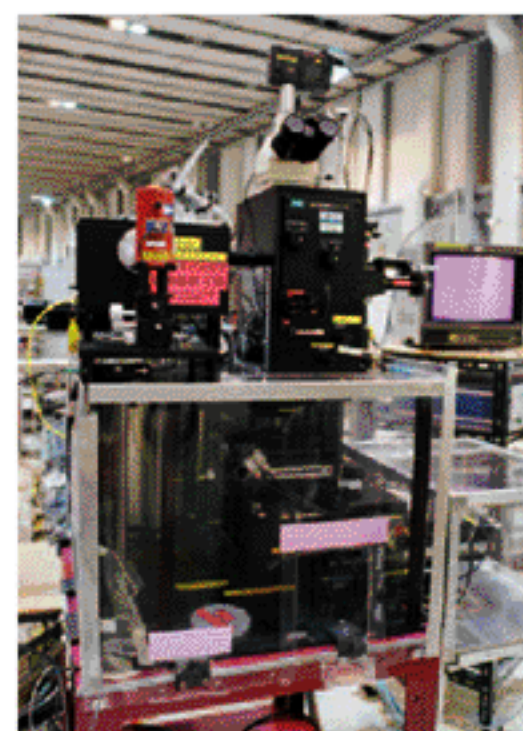




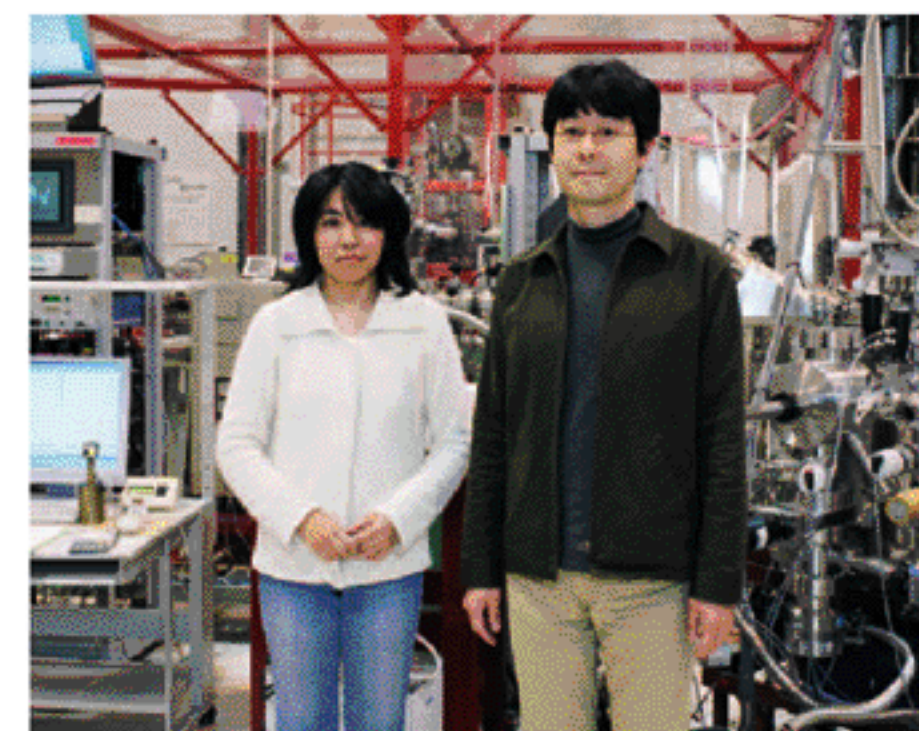
The SPring-8 Website is renewed:  
<http://www.spring8.or.jp/en/>

## Infrared Materials Science Beamline, BL43IR

Compared to the infrared thermal radiation, infrared synchrotron radiation has an advantage of high brilliance and is suitable for applications in microscopy. BL43IR has two microspectroscopy stations. One has a 14 T superconducting magnet for studies of magneto-optical properties. The other has a microscope with a large working distance of 100 mm, which is useful for installing various attachments such as a cryostat and a diamond anvil cell. The highest spatial resolution without aperture reaches approximately 10  $\mu\text{m}$  in mid-infrared region, and close to the diffraction limit in far-infrared region. The far-infrared microscopy is a powerful tool to observe molecular vibration feature at certain micron-scale area and an originally developed technique by high brilliance beam at BL43IR of SPring-8.



Infrared microspectroscopy station



Dr. Yuka Ikemoto (left) and Dr. Taro Moriwaki (Beamline Scientists)

## Imaging Phase Separation near the First order Mott Transition of the Strongly Correlated Organic Superconductors $\kappa\text{-(BEDT-TTF)}_2\text{X}$

Drs. Takahiko Sasaki (Tohoku University), Yuka Ikemoto, Hiroaki Kimura (JASRI/SPring-8) and their research team found the electronic phase separation consisting of the metallic and insulating domains with 50 – 100  $\mu\text{m}$  in diameter in the organic Mott system  $\kappa\text{-}[(h8\text{-BEDT-TTF})_{1-x}(d8\text{-BEDT-TTF})_x]_2\text{Cu}[\text{N}(\text{CN})_2]\text{Br}$  by means of scanning micro-region infrared spectroscopy using the synchrotron radiation at SPring-8. Inhomogeneous electronic states have been suggested in several experiments such as NMR near the Mott transition line but the nature of such the inhomogeneity has not been understood well. In this study, real-space image of the local electronic state is obtained by detecting shift of the frequency  $\omega_3$  of a molecular vibration mode  $\nu_3(a_g)$ [1,2]. The specific  $\nu_3(a_g)$  mode, which is a symmetric stretching mode of the central double bonded carbon atoms of the ET molecule, is sensitive to the difference between metal and insulator. The Mott transition occurs around  $x = 0.5$  at 4 K. Fig.1 shows the two-dimensional contour map with  $x = 0.6$ . A phase separation appears in the samples with  $x = 0.5 - 0.8$ . The phase separation phenomenon observed in this class of organics is considered on the basis of the strongly correlated electronic phase diagram with the first order Mott transition.

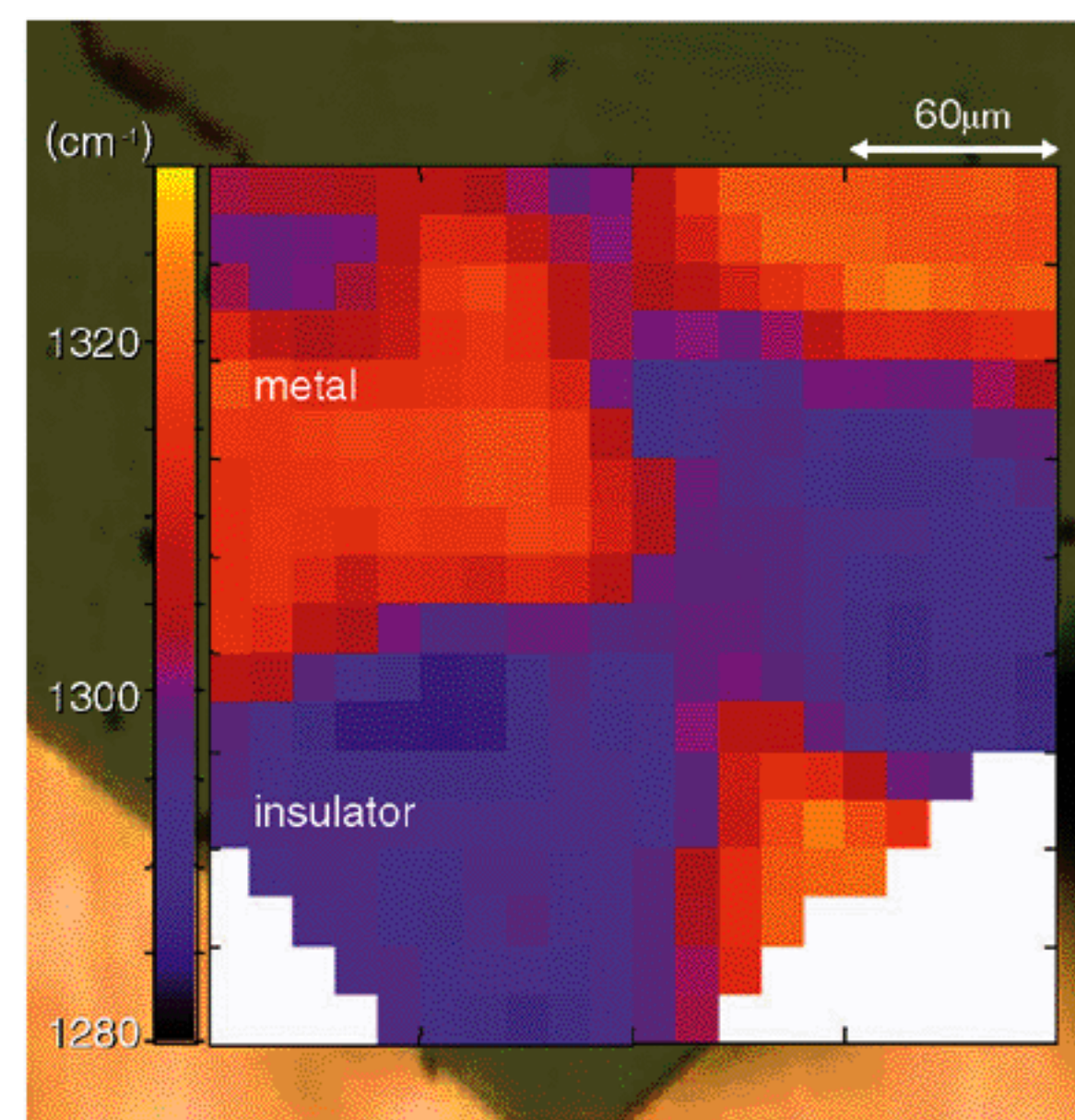


Fig.1  
 Two dimensional contour map of  $\kappa\text{-}[(h\text{-BEDT-TTF})_{1-x}(d\text{-BEDT-TTF})_x]_2\text{Cu}[\text{N}(\text{CN})_2]\text{Br}$  with  $x=0.6$  at 4 K. Bright color (higher frequency) indicates the metallic nature and dark color (low frequency) does the insulating one.

- 1) T. Sasaki, N. Yoneyama, N. Kobayashi, Y. Ikemoto and H. Kimura, Phys. Rev. Lett. **92**, 227001 (2004).
- 2) T. Sasaki, N. Yoneyama, A. Suzuki, N. Kobayashi, Y. Ikemoto, and H. Kimura, J. Phys. Soc. Jpn. **74**, 2351 (2005).

### SRI 2006

The 9th International Conference on Synchrotron Radiation Instrumentation (SRI 2006), co-hosted by Pohang Accelerator Laboratory (PAL) and JASRI/SPring-8, will be held at the EXCO center, Daegu, Korea, from May 28 to June 3, 2006.

<http://sri2006.postech.ac.kr/>