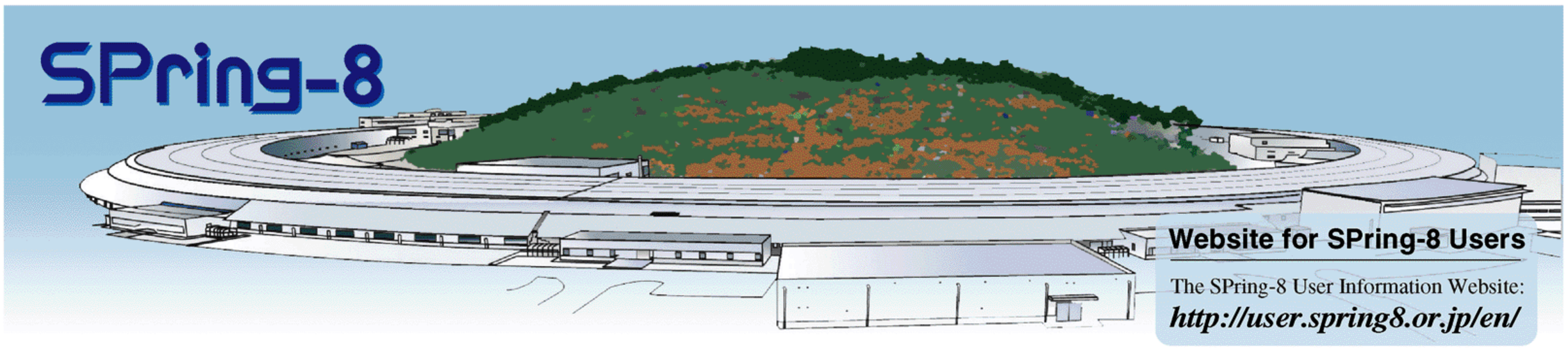
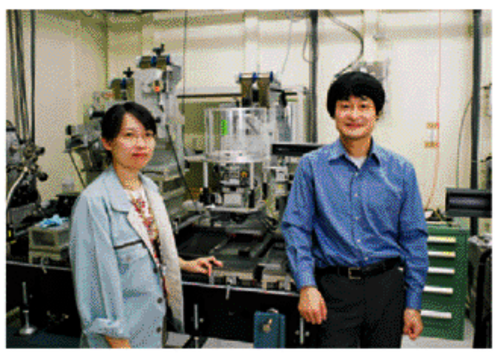
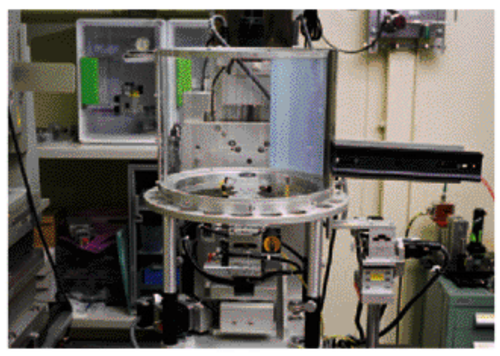


Surface and Interface Structures Beamline, BL13XU

Our mission at BL13XU is to offer user-friendly access to a two-dimensional crystallographic research at atomic-scale resolution. The main technique is the combination of X-ray diffraction and scattering; in addition, surface science facilities for analysis and growth are available. Target samples include a variety of materials ranging from hard matter (such as metal and inorganic material) to soft matter (such as organic semiconductor). The beamline has three experimental hutches and representative facilities including a multi-axis diffractometer and three ultra-high vacuum chambers that can be independently coupled to a six-circle diffractometer.



Dr. Osami Sakata (right) and Ms. Akiko Kitano (Beamline Scientists)



The diffractometer used for showing a diffraction pattern of embedded Bi nanowires

Encapsulation of Atomic-scale Nanowires in Epitaxial Silicon

Drs. Osami Sakata (JASRI/SPring-8), Kazushi Miki (NIMS), David R. Bowler (ICYS), and their team members demonstrated, using X-ray diffraction, that Bi nanowires fabricated on a Si(001) surface was embedded in crystalline silicon while retaining their one-dimensional characters and other important aspects of their structure. For nanoelectronic applications, a nanostructure comprised of more than two nanoscale single-unit structures is required, and it is called a nanoscale architecture. During epitaxial growth, a nanostructure tends to become fragile or even destroyed due to surface segregation; but Dr. Miki's research group succeeded in encapsulating Bi nanowires in silicon by a new epitaxial method they proposed to avoid the phenomenon.

The established X-ray diffraction techniques combined with synchrotron radiation had not revealed a structure of the embedded Bi nanowires. Dr. Sakata, however, succeeded in showing a diffraction pattern of the nanowires by the reciprocal-lattice space imaging method using high-energy monochromatic X-rays at the Surface and Interface Structures Beamline, BL13XU, of SPring-8 (see fig.1). Furthermore, Dr. Bowler used the X-ray diffraction results and proposed its atomic structure by nanosimulation based on the density functional theory (see fig.2). The research we here introduced implies that rapid and close cooperation between nanostructural fabrication, evaluation, and simulation is key to success. [Phys. Rev. B 72, 121407(R) (2005)]

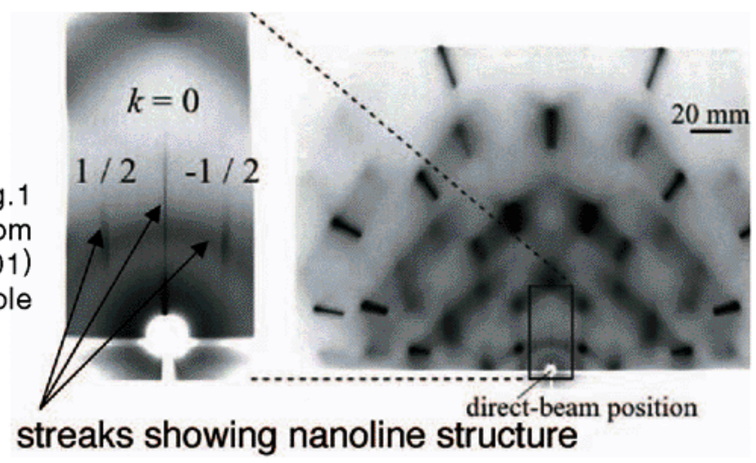


Fig.1
X-ray diffraction pattern from the Si epilayer cap/Bi nanolines/Si(001) substrate sample

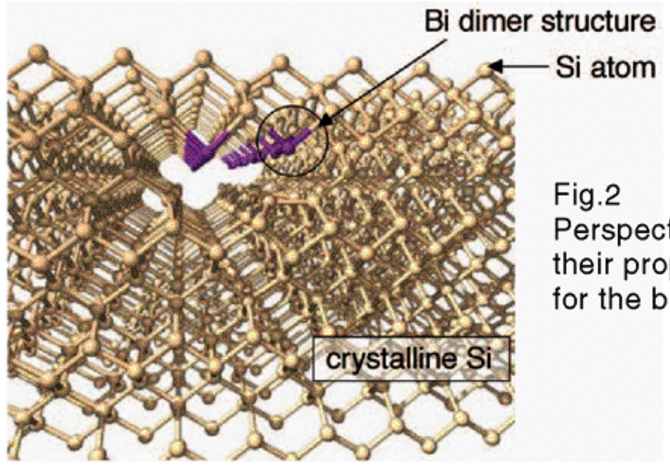


Fig.2
Perspective view of their proposed model for the buried Bi lines

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9th SPring-8 Symposium

The 9th SPring-8 Symposium will be held at SPring-8 from November 17 to 18, 2005.

http://www.spring8.or.jp/sp8_sympo-9/

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/

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