Estimation of Lattice Structure of Strained-Si Wafers using Highly Parallel X-ray Microbeam (II)

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Strained-Si (s-Si) wafers are expected as the next generation high-speed electronic devices. In order to estimate the crystallinity of s-Si wafers, we developed a high flux X-ray microbeam with a small angular divergence and a narrow energy bandwidth. The X-ray microbeam is formed at SPring-8 by combining the Si single crystals and an X-ray mirror.

We estimated two commercially available s-Si wafers. One is a s-Si/SiGe/Si wafer and the other is a s-Si/SiO2/Si wafer. The thicknesses of s-Si layers of two samples are 17 nm and 15 nm, respectively. The high flux X-ray microbeam enable us to obtain the reciprocal lattice maps of these extremely thin s-Si layers.

The intensity distributions in reciprocal lattice space maps reveal that the lattice parameters of s-Si layers are almost the same as expected values. However, the crystallographic directions normal to s-Si lattice planes greatly distribute about 500 micro radian.

[1] Matsui J., et al., *proceeding of the 4th international symposium on advanced science and technology of Si Materials*, 2004, 237.

Keywords: silicon technology, synchrotron x-ray diffraction, x-ray microanalysis of thin specimens