X-RAY PHASE CONTRAST IMAGING STUDY OF ACTIVATED CARBON/CARBON COMPOSITE

K. KOBAYASHI(0003403), K. IZUMI(0004081)*, S. KIMURA(0004124), H. KIMURA(0001267), T. OHIRA(0004654), T. SAITO†, Y. KIBI†, K. TAKAI(0003438) ††, T. IBUKI(0004208) ††, Y. KAGOSHIMA†† (0001230), J. MATSUI†† (0001232)

Fundamental Research Laboratories, NEC Corporation, 34 Miyukigaoka, Tsukuba, Ibaraki 305-8501

† Fundamental Material Research Laboratories, NEC Corporation, Kawasaki, Japan

†† Faculty of Science, Himeji Institute of Technology, 1475-2 Kanaji, Kamigori, Ako, Hyogo 678-1297

X-ray phase contrast is a new imaging method based on the refraction of x-rays. This method is a useful tool for weakly absorbing materials such as biological samples because the refraction is more sensitive than the absorption for the light atomic elements. However, this method is not applicable for the electronic devices because of the low spatial resolution. In this report we present the x-ray phase contrast measurements with high spatial resolution. The transimitted x-rays from a sample were expanded by using analyzer crystals with asymmetric Bragg reflection (asymmetric factor b). Since the analyzer crystals were placed in (+,-) arrangements in both vertical and horizontal directions, the total magnification factor became $1/b^2$ for each direction.

The x-ray phase contrast measurements were performed at Hyogo-beamline 24XU in SPring-8. The x-rays emitted from the 8-figure undulator were monochromatized to λ = 0.83 Å by using the Si (111) double crystal monochromator. The typical beam size was 1×1 mm^2 at the position of the sample. By using the Si analyzer crystals with a surface plane (100) and a diffraction plane (511), the transmitted x-rays were magnified about 23 times. The spatial resolution was about 2 μm. We applied this method to activated carbon/carbon composite which are used as electrodes of electric double-layer capacitors (EDLCs) so that it was possible to observe the phase contrast corresponding to the carbon particle with 10 μm.