

Internal Deformation Field Distribution of Gold Nanoparticles and Zeolite Microcrystals by Coherent X-ray Diffraction Imaging

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Coherent x-ray diffraction imaging (CXDI) technique restores the oversampled CXD patterns to the real 3-dimensional image of the sample and internal deformation field distribution by phase-retrieval algorithm [1]. In the recent study, we observed an unusual "triangular" deformation field structure of ZSM-5 zeolite microcrystals arising from the heterogeneous core-shell structure due to residual organic templates [2]. The experiments were performed at the 34ID-C beamline in Advanced Photon Source, USA and employed monochromatic radiation with X-ray energy of 9 keV. The CXD patterns were obtained at (200) and (020) Bragg condition with unfocused beam. We have made progress in similar setup at the beamline 9C in Pohang Light Source, Korea. The CXD patterns were measured on gold nanoparticles with size of ~100 nm and ZSM-5 zeolite microcrystals with size of ~2 um attached on Si (100) substrate were obtained. The development of CXDI setup will be reviewed and the results in terms of coherent volume of scattering will be discussed.

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[1] Ian K. Robinson and Ross Harder, *Nature Materials*, **8**, 291-298(2009)

[2] Wonsuk Cha, Nak Cheon Jeong, Sanghoon Song, Hyun-jun Park, Tung Cao Thanh Pham, Ross Harder, Bobae Lim, Gang Xiong, Docheon Ahn, Ian McNulty, Jungho Kim, Kyung Byung Yoon, Ian K. Robinson & Hyunjung Kim, *Nature Materials* doi:10.1038/nmat3698