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3D coherent X-ray diffractive imaging of an Individual colloidal crystal grain A. SHABALIN[1], Deutsches Elektronen-Synchrotron DESY, Germany, J.-M. MEIJER, Debye Institute for Nanomaterials Science, Utrecht University, Netherlands, M. SPRUNG, Deutsches Elektronen-Synchrotron DESY, Germany, A. V. PETUKHOV, Debye Institute for Nanomaterials Science, Utrecht University, Netherlands, I. A. VARTANYANTS, Deutsches Elektronen-Synchrotron DESY, Germany — Self-assembled colloidal crystals represent an important model system to study nucleation phenomena and solid-solid phase transitions. They are attractive for applications in photonics and sensorics. We present results of a coherent x-ray diffractive imaging experiment performed on a single colloidal crystal grain. The full three-dimensional (3D) reciprocal space map measured by an azimuthal rotational scan contained several orders of Bragg reflections together with the coherent interference signal between them. Applying the iterative phase retrieval approach, the 3D structure of the crystal grain was reconstructed and positions of individual colloidal particles were resolved. We identified an exact stacking sequence of hexagonal close-packed layers including planar and linear defects. Our results open up a breakthrough in applications of coherent x-ray diffraction for visualization of the inner 3D structure of different mesoscopic materials, such as photonic crystals.

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