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Phase Domain Structure of a Manganite[1] IAN ROBINSON, XIAOQIAN CHEN, YUE CAO, Brookhaven National Lab, ROSS HARDER, Argonne National Lab — X-ray Bragg Coherent Diffraction Imaging of nanocrystals of La0.5Ca0.5MnO4, carried out at the 34-ID-C beamline of APS, at one of the bulk crystal Bragg peaks has revealed an interesting new structure. 3D series of diffraction patterns, obtained while "rocking" the sample through a fraction of a degree, showed a strong speckle structure attributed to a domain structure rather than the simple fringed flares expected from a facetted crystal. The 3D diffraction pattern was inverted to a complex image showing massive strain effects, containing a mosaic of domains of regions with different phase of the complex density function, in the range $-\pi<\varphi<\pi$, conveniently represented on a color wheel. These correspond to rigid shifts of the crystal lattice of zero to one unit cell in magnitude This is a little like traditional picture of mosaic spread, except that the domains are only shifted (translated) and not rotated. The behavior has not been noted before. We identify this preliminary result as a new form of crystal mosaic disorder. Further investigation is planned to discover whether these phase domains are fundamental in nature or coupled to the crystal growth and subsequent treatment to prepare nanomaterials.

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