

# Three-dimensional visualization of phase-ordering in an Fe-Al alloy by coherent x-ray Bragg ptychography

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## Abstract

We performed coherent x-ray Bragg ptychography [1,2] on phase ordered domains in an FeAl binary alloy [3]. This experimental scheme offers the possibility of visualizing the phase shift of the radiation scattered by the sample, which is related to the atomic structure such as lattice strain and phase ordering. Fe-Al alloys display phases where atoms order on a sub-lattice resulting in an emergence of superlattice reflections, which are forbidden in the typical bcc structure [4,5]. The degeneracy of the ordered structures results in domain boundaries that, in addition to the general strain of the lattice, will give a phase shift depending on which reflection is probed. We investigated the lattice strain associated with phase ordered domains by imaging both the (002) fundamental and the (001) superlattice Bragg reflections of FeAl (45 At% Al) in the B2 phase [6,7]. Using the (002) data, the (001) images could be normalized for lattice strain and visualize ordered domains in 3D for the first time.

**Keywords:** *Bimetallic alloy, phase ordering, coherent diffractive imaging, Bragg ptychography*

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