

Abstract Submitted
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Non-cubic, coherent nanoprecipitates observed by neutron diffuse scattering in highly magnetostrictive Galfenol ($\text{Fe}_{1-x}\text{Ga}_x$) alloys.¹ PETER GEHRING, National Institute of Standards and Technology, HU CAO, CHRIS DEVREUGD, Virginia Tech, JOSE ABELARDO RODRIGUEZ, University of Maryland, JIE FANG LI, DWIGHT VIEHLAND, Virginia Tech — We report neutron diffuse scattering measurements on highly magnetostrictive $\text{Fe}_{1-x}\text{Ga}_x$ alloys with different thermal treatments. Diffuse scattering is seen for compositions $0.14 < x < 0.20$ heat-treated to increase the magnetostriction that is otherwise absent. This diffuse scattering exhibits asymmetric peaks at the (100) and (300) reciprocal lattice positions that are consistent with the coexistence of short-range ordered, coherent nanoprecipitates embedded in a long-range ordered, body-centered cubic matrix. A large peak splitting is observed at (300) for $x=0.19$, which suggests that the nanoprecipitates are not cubic but have a lower symmetry and a large elastic strain. The strongest diffuse scattering occurs for $x=0.19$ where the maximum magnetostriction is found. This suggests a structural origin for the enhanced magnetostriction in these materials.

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