

Abstract Submitted
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Synthesis of L10 FeNi thin films via High Speed Rapid Thermal Annealing¹ JULIUS DE ROJAS, Univ of California - Davis, DUSTIN GILBERT, JUNE LAU, National Institute of Standards and Technology, Gaithersburg, MD, KAI LIU, Univ of California - Davis — High magnetic anisotropy materials are critical for future ultrahigh density magnetic recording and permanent magnet technologies, particularly those that are rare-earth-free and precious-metal-free. Alloys of FeNi can form a metastable high anisotropy $L1_0$ phase, but convenient methods of achieving the $L1_0$ ordering have remained elusive. Here we report the synthesis of high-anisotropy $L1_0$ -Fe₅₀Ni₅₀ alloys via sputtering of alternating atomic layers of Fe and Ni, followed by a high speed rapid thermal annealing (RTA). Compared to as grown FeNi (4nm) films that are magnetically soft, RTA treated samples exhibit substantial increases of coercivity by 1-2 orders of magnitude. Magnetization reversal characteristics analyzed by the first-order reversal curve (FORC) technique show the emergence of a new high-anisotropy phase after RTA, and a phase fraction is extracted. Microstructure analysis by electron diffraction reveals a corresponding appearance of previously forbidden diffractions, consistent with the $L1_0$ ordering. These results demonstrate a convenient approach to achieve high-anisotropy $L1_0$ -FeNi.

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