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Hydrogenation-induced strengthening of exchange bias coupling in antiferromagnetic Pd-rich alloy films

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Abstract

Hydrogenation has recently been proposed for use in modulating the magnetic properties of Pd-rich ferromagnetic (FM) alloy films. This study successfully fabricated Pd-rich Mn/MnPd/Fe antiferromagnetic/FM films with an established exchange bias field at RT, and determined that hydrogenation can enhance the exchange bias coupling in such films. Specifically, magnetic hysteresis loops revealed that the magnetic state of the Pd-rich Mn/MnPd/Fe films was gradually changed from an unbiased state to an exchange-biased state upon exposure to a hydrogen environment; moreover, hydrogenation engendered a larger magnitude of the exchange bias field than conventional field cooling. This phenomenon can be attributed to the enhanced long-range antiferromagnetic ordering of the Pd-rich MnPd film upon uptake of hydrogen atoms.

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