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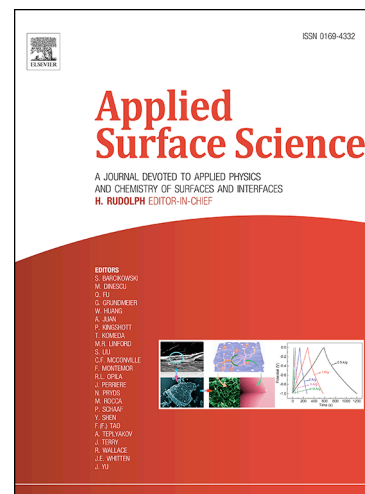
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Effect of laser pulse repetition rate on morphology and magnetic properties of cobalt ferrite films grown by pulsed laser deposition

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Abstract

In this paper, we report a switch of magnetic anisotropy in CoFe_2O_4 (CFO) films induced by change in laser pulse repetition rate. CFO films were deposited on MgO (001) substrates using pulsed laser deposition method with 2, 3, 5, 7 and 10 Hz laser pulse repetition rates. Atomic force microscopy images exhibited the film surface aggregation tends to compact shape with large size islands on the surface of the samples deposited by 2 and 3 Hz while the size of islands decreased on the surface of the 5, 7 and 10 Hz CFO films. The hysteresis curve of films indicated magnetic anisotropy and switching of the easy axis direction by changing laser repetition rates. The films grown at 2 and 3 Hz exhibit an in-plane easy axis, while by increasing the laser repetition rate, the easy axis switches to out-of-plane. The Raman spectra showed the rearrangement of Fe^{3+} and Co^{2+} cations on octahedral and tetrahedral sites in the structure by changing the laser pulse repetition rate. Change in the strain, morphology evolution and cation distribution are responsible for the change in easy axis direction and existence of shrinking at M-H loops.

Keywords: Cobalt ferrite, Magnetic perpendicular anisotropy, Strain, Island structure, film, PLD.

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