Structural, morphological and magnetic properties of iron oxide thin films obtained by atomic layer deposition as a function of their thickness

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Abstract
Hematite (α-Fe2O3) thin films with different thicknesses between 4 and 16 nm were synthesized by atomic layer deposition, employing 500 to 2000 cycles of FeCp2/O3. After a thermal reduction process, under a controlled atmosphere of hydrogen, it was possible to convert hematite to magnetite (Fe3O4). SEM images of the iron oxide thin films showed that they are macroscopically homogeneous, although the magnetic measurements by MOKE indicated that the samples should present holes that are responsible for pinning the domain walls, raising the coercivity to values that vary between 0.3 and 0.7 kOe. XRD revealed the presence of the Fe3O4 phase by identifying the main peaks. The signal obtained by Raman spectroscopy was identified at 667 cm−1, which suggests the presence of the phonon mode A1g of Fe3O4 in the reduced sample. Controlling the thickness of Fe3O4 thin films allows adjusting their magnetic properties, coercivity and remanence, so that they can be used in potential technological applications.

Author keywords
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