TAILORED MAGNETIC AND ELECTRONIC STATES IN 3D-METAL–INSULATOR FILMS: CHARACTERIZATION AND APPLICATIONS

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Progress in designing of new low-cost magnetoelectronic planar devices requires new artificial fims combining tunable magnetic and electric properties. In this context metal-insulator films (see Figure) are prospective for synthesis of materials with tailored physical properties that could be controlled with films composition and synthesis regimes [1, 2]. Present overview covers the summary of recent experimental results on complimentary and systematic study of macroscopic and local magnetic properties of films using VSM and Mössbauer spectroscopy with respect to phase composition and structural analysis at nanoscale by XANES, TEM and HRTEM. Specific relashionship between films structure and resulting magnetic properties (SP relaxation, core-shell exchange interaction, perpendicular magnetic anisotropy) is considered. Effects of magnetic and electric percolation in films are discussed in correlation with synthesis regimes (atmosphere of deposition, temperature of the substrate) and films composition. Physical mechanisms and models responsible for magnetic and electric properties of composite films are analyzed. Finally, technological approaches are proposed for tuning films properties towards their desired combination with respect to application in designing of planar (non-coil) inductive elements and sensors.

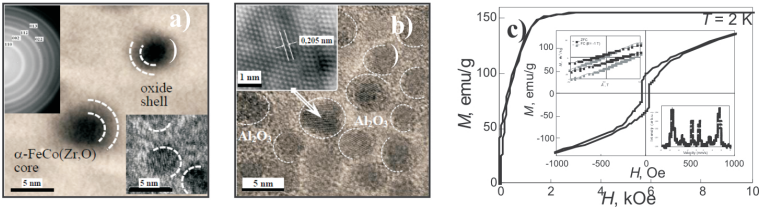

Figure 1: TEM (a) and HRTEM (b) images of nanocomposite films revealing exchange bias and perpendicular magnetic anisotropy (c).

References

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