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Presented at the 49th Conference on Magnetism and Magnetic Materials, November 7-11, 2004, in Jacksonville, Florida

GROWTH OF ELECTRICALLY AND MAGNETICALLY TUNABLE BSTO/BaF MULTILAYERS

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CONDENSED MATTER SCIENCES DIVISION
OAK RIDGE NATIONAL LABORATORY
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with the
U.S. DEPARTMENT OF ENERGY
Oak Ridge, Tennessee

June 2004

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Submitted Abstract

on June 19, 04:53 PM

for MMM

Abstract Proof

CONTROL ID: 91727

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Abstract details

CATEGORY: VI. Structured Materials

SUBCATEGORY: B. Multilayer Films and Superlattices

PRESENTATION TYPE: Oral

TITLE:

Growth of electrically and magnetically tunable BSTO/BaF multilayers

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ABSTRACT BODY:

Multilayers of $Ba_{0.5}Sr_{0.5}TiO_3$ (BSTO) and $BaFe_{12}O_{19}$ (BaF), with tunable permeability and permittivity are attractive systems for radio frequency and microwave applications. We have grown multilayers of BSTO and BaF using magnetron sputtering on thermally oxidized Si *(100)* and Al_2O_3 substrates. Film growth conditions such as sputtering parameters, substrate annealing were optimized to obtain high quality multilayers. The as-grown films were amorphous and different annealing procedures were explored to stabilize crystalline phases. X-ray diffraction established that both BSTO and BaF were formed and cross-sectional SEM studies showed sharp interfaces between BSTO and BaF layers. Magnetization, M(H), showed a large coercivity *(~ 2500 Oe)* consistent with the hard magnetic hexaferrite component. The hysteresis loops also revealed the distinct influence of magnetocrystalline and shape anisotropies at different temperature ranges. The multilayers were then used as substrates on which ordered arrays of Fe_3O_4 nanoparticles were deposited using the Langmuir-Blodgett method. A room temperature thin film impedance measurement system based on lateral probe fixtures has been set up to study the frequency response up to 3 GHz using a vector network analyzer. Preliminary measurements and analysis of the frequency dependence and tunability of these structures under applied electric and magnetic fields will be presented.

HS acknowledges support from DARPA through the Department of Army Grant No. DAAD19-03-1-0277.