NATO Advanced Research Workshop

Functional Spintronic Nanomaterials
for Radiation Detection and Energy Harvesting

This workshop is supported by: The NATO Science for Peace and Security Programme

Coaxial ferrite-ferroelectric nanofibers: Magnetoelectric interactions and potential device applications

Srinivasan,G.
[1],srinivas@oakland.edu, Oakland University, Rochester, MI
[2] USA

Composites of ferromagnets and ferroelectrics are of importance for studies on the nature of magneto-electric (ME) interactions between the two phases that is aided by mechanical strain induced in magnetic (H) or electric fields (E). Potential applications for such composites include energy harvesting, memory devices, sensors, and microwave devices. This presentation will be on the synthesis of core-shell nanofibers of spinel and hexagonal ferrites and PZT and barium titanate (BTO) by electrospinning and studies on ME interactions by measuring the changes in magnetic order parameter in E-field or ferroelectric order parameters in H-field [1,2]. Studies were carried out on coaxial fibers of nickel ferrite (NFO)-PZT/BTO and M-, Y- or W-type hexagonal ferrites and PZT/BTO [1,2]. Fibers were annealed at 900-1200 C and characterized by XRD, SEM, and SPM techniques and were found to be free of impurity phases. Fibers with shell diameter of 200 nm-1 ⌣m showed well defined core and shell structure and defect free interface. The strength of ME coupling measured by H induced ferroelectric polarization revealed strong interaction with fractional change in remnant polarization as high as 20%. Films of the fibers assembled in a magnetic field were used to measure the ME voltage coefficient that varied from 10 to 200 mV/cm Oe. Evidence for strong ME coupling was also obtained from ferromagnetic resonance in an applied E-field.

References

1. 1. Y. Liu, P. Zhou, J. Fu, et al., *MRS Communications, 2020, 10, 230.*
2. Y. Liu, G. Sreenivasulu, P. Zhou, J. Fu, et al, *Scientific Reports*, 2020,10, 1.

.