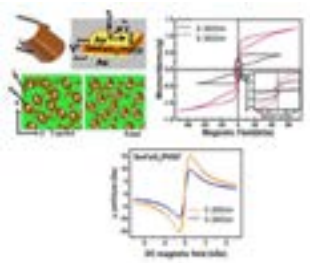
Exploring multiferroic materials for enhanced magnetoelectric coupling

Anju Ahlawat
Raja Ramanna Centre for Advanced Technology, India

Magnetoelectric multiferroics represent a dynamic research topic motivated by both the need to understand the coupling mechanism and potential applications. Among the multiferroic family, the nanoscale heterostructured composites are of particular appealing due to their relatively high ME performance with respect to their single phase counterparts. The electric field manipulation of magnetic properties in multiferroics is highly demanding for the opportunities provided in low-energy-consuming spintronics devices. The present work focuses on the development of a ME nanocomposite films comprising of highly magnetostrictive magnetic ($SmFeO_3$) and piezoelectric ferroelectric (PVDF) materials, which exhibits tuneable magnetoelectric response at room temperature. In this work, the manipulation of magnetic ordering with applied electric fields has been realized in polymer based magnetic thin films. Electric field poling induces significant change in magnetization and magneto electric response of composite films. Indeed $SmFeO_3$ has excellent magnetic properties such as fast magnetic switching and an easy axis rotation transition (known as spin reorientation transition -SR) from c-axis to a-axis around 480 K. It is of particular interest for the magneto electric applications by utilizing its anomalous magnetoelastic properties near room temperature. The poling process produces sufficient strain in the ferroelectric PVDF matrix to reorient the magnetization of $SmFeO_3$. Large magneto electric responses as well as good electric field control of the magnetization at room temperature makes these flexible composite films promising to be used for magnetoelectric sensors, memory storage and spintronic devices. Possible innovative applications have been addressed for these composites.



Biography

Anju Ahlawat (PhD - Physics), now is DST Faculty at Laser material Section, Raja Ramanna center for advanced technology, Indore (India). She got her B Sc and M Sc in Physics. She got her Doctor's degree (Ph.D.) in material science (Physics) from UGC -DAE Consortium for scientific research, Indore (India) in 2012 and a 4 years post doc experience from Raja Ramanna center for advanced technology, Indore, India. She has been working as Visiting Scientist at Martin Luther University, Halle, Germany for 6 months. She has got a prestigious research award from DST inspire Faculty in 2014. Currently Dr. Ahlawat's research focus on novel multiferroic nanostructures for enhanced magnetoelectric coupling. She has published more than 20 papers in reputed journals.

anjahlawat@gmail.com

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