

**Date: 21-12-2015**

**Time: 11:00 AM**

# **Invited Talk**

**By**

**Prof. (Dr.) S.K. Bandyopadhyay**

**Ex-Head, Material Science Studies Division**

**Variable Energy Cyclotron Centre (VECC)**

**Dept. of Atomic Energy , Govt. of India**

**on**

**Studies on Multifunctional Nanostructured Materials**

**Organized By**

**Dept. of Basic Sciences and Humanities**

**Meghnad Saha Institute of technology, Kolkata.**

## **Abstract of Lecture**

Multifunctional materials are of today's quest. Miniaturization, i.e. development of these materials in the form of nanomaterials is of primary need considering their application in devices. Moreover, if these are obtained in nanostructured form, they can bring wonders.

Recently, we have adopted for developing multiferroic  $\text{BiFeO}_3$  (BFO) with simultaneous antiferromagnetic, ferroelectric & ferroelastic behaviour in form of nanostructures like nanorods, nanowire etc. by employing Anodised Alumina (AAO) template with various pore sizes from 20nm with solution route followed by controlled vacuum filtration and sintering. Diameters of nanorods are in the range of 20-100 nm as observed by FESEM. Capacitance assayed by cyclic voltammetry (CV) and charge discharge processes reveals a very high value of specific capacitance of 450F/gm. Capacitance has been estimated by extrapolating the charge collected at the electrode to that at scanning rate of infinity which is relevant for the charge collected at the nanorods protruding out of the template. Charging and discharging times are quite constant over a large number of cycles.

This large value of specific capacitance can be attributed to the nanostructure form of BFO nanorod.

The high value of specific capacitance of BFO nanorods brings forth its use as electrode in storage energy devices. Also, a high value of polarization as well as a significant magnetic susceptibility are observed in multiferroic Bismuth Ferrite (BFO) in the form of nanorods protruding out. The high values of polarization and magnetic susceptibility are attributed to the structured form of BFO nanorods giving rise to the directionality. There is no leakage current in P-E loop examined at various fields and frequencies. Magnetocapacitance measurements reflect a significant enhancement in magnetoelectric coupling also.

We have also developed a variety of conducting polymer (like PANI, PEDOT etc.) and graphene based nanocomposites with a large value of specific capacitance for use as energy storage device. Also, some novel nanostructures have been developed using low energy ion beam irradiation. All these aspects will be discussed

### **About the Speaker**

Prof. (Dr.) S.K. Bandyopadhyay is an Ex– Head and Professor of Material Science Studies Division, Variable Energy Cyclotron Centre, Dept. of Atomic Energy. He has done his PhD from Jadavpur University and post doctoral work from Atomic Institute of Vienna, 2000 . His research interest is in the area of Superconductivity, Multifunctional Materials, Oxides & Perovskites, Conducting Polymers, Energy Storage Materials , etc. He has published more than 83 papers and articles in internationally reputed journal. He has attended more than 51 national and international conferences. He is also a reviewer of many Science Direct Journals.

**ALL ARE WELCOME**

**Venue**

**Language Lab II**