SCO-Young Scientist Profile

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Details of research work carried out in S&T (*limit to 200 words*)

In the part of Ph. D, $ACr_{1-x}Fe_xO_3$ (A=Nd/Gd/Er) perovskite nanoparticles were prepared by sol-gel auto-combustion technique. All the samples except $ErFeO_3$ sample showed single phase orthorhombic structure. Crystalline size is calculated and is found to be in the order of 50nm. Impedance measurements have carryout at 1Hz-1MHz frequency, RT-500^oC temperature ranges. Impedance of all samples noticed non-Debye type and semiconducting behavior. Dielectric constant of all samples except $GdFeO_3$ sample showed giant dielectric behavior (>10^3). Conductivity of all samples increased with increasing frequency and temperature. Conductivity decreased with increase in Fe content. All samples except $ErFeO_3$ showed weak ferromagnetic behavior, $ErFeO_3$ exhibited ferromagnetic behavior. Also, M-T plots of $NdCr_{1-x}Fe_xO_3$ were carried out under up to 300K at 0.01T, 0.5T fields. M-T curve of x=0, 0.3 samples at 0.01T field exhibited novel magnetic (diamagnetic like) behavior, with further increase in Fe content reversal magnetism is disappeared. $NdCrO_3$ showed relaxor ferroelectric behavior near 178^oC at 100 Hz and 225^oC at 1 MHz. $NdFeO_3$ is exhibited ferroelectric in nature, maximum polarization (Pmax) is 0.088 $\mu C/cm^2$, and the remanence polarization (Pr) is 0.014 $\mu C/cm^2$ at the applied field 2 kV. These materials are useful for giant dielectric capacitor, superconductor, multiferroic, and energy storage device applications. This briefly highlighted information is the evidence for the significant innovation for practical applications in science and technology. The detailed investigations were reported by me in various peer reviewed international science citation indexed journals.

Associated SCO-YSC Theme:

Statement of Innovation ***(Brief information on new innovative ideas including startup / entrepreneurs- limit to 150 words)***

Title: Synthesis and characterization of rare earth and transition metal doped perovskites for multiferroic applications

(2. Sustainable energy and energy storage)

Objectives:

1) Prepare $LRFe_{1-x}Mn_xO_3$, $HRFe_{1-x}Mn_xO_3$, $HR_{1-x}LR_xFeO_3$, $HR_{1-x}LR_xMnO_3$ (LR- Light rare earth and HR- Heavy rare earth) bulk and thin films.

2) Study the XRD, SEM, TEM, EDEX, AFM, Raman, and FTIR properties

3) Study the optical, photo catalytic activity and photoluminescence properties

4) Study the magnetic, dielectric, magnetoelectric coupling, magnetocapactive, P-E, P-T, P-H, I-V, and Hall effect properties

5) Correlate all these properties each other.

6) To establish rules and protocols for their synthesis of multiferroic materials

7) To develop methods for understanding and estimation of the improved properties of the different materials.

8) Understand the origin of ferroclectricity, ferromagnetism to found the multiferroic correlation in these systems

9) Understand the properties of material to identify the commercial and industrial applications.

10) Investigate and propose at least one multiferroic device for practical application.

Major awards/ Achievements ***(Upto 3 awards)***

1. University Potential Excellence, 2. Basic Science Research,

3. Rajiv Gandhi National Fellowship, 4. Telangana State Eligibility Test

Possible collaboration with SCO countries ***(limit to 100 words)***

Russia and China

Key words ***(relevant to research work conducted as well as proposed innovation, 5-6 words)***

Multiferroic, ferroclectricity, ferromagnetism, dielectric, Perovskite thin films