Conclusion :

Conclusion of the works carried out in this thesis has been divided in two parts:

(A) Multiferroics

Single phase multiferroic materials are very rare in nature. Multiferroic materials with magnetoelectric coupling are even rarer. We have investigated geometrical spin frustrated systems ($CuMnO_2$ & $CuCrO_2$). A unconventional magnetic ordering such as Spin glass ,Griffith phase and exchange bias has been demonstrated for these studied systems.

We have studied multiferroic system (CuCrO2) in which we have established magneto electric coupling. In polarization measurement, there having evidence that no electric polarization was observed in $CuCrO_2$ in absence of fields. However, in the presence of poling electric field of 400kV/m, the sign reversal of polarization observed by reversing the direction of poling electric field. The observed magnitude of polarization in presence of magnetic field 3T and 5T becomes ~32μC/m^2 and ~ 37μC/m^2, respectively which signifies the signature of linear magneto electric effect. This system is useful in many application based system such as magneto electric sensor and storage devices.

(B) Magnetism

$CuMnO_2$ system having Crednerite structure which is distorted form of Delafossite structure which leads to possibility of getting unconventional type of magnetic ordering such as spin glass, Griffith phase , exchange bias etc. In this thesis, we have observed Griffiths-like phase in CuMnO2 system. In this system the exchange interaction at short bonds is stronger, which, with the uniaxial magnetic anisotropy of Mn^{3+}, leaves the system frustrated. This frustration may induce the Griffith-like phase.

From the study, we have observed: (i) In DC magnetic measurements, a sharp downturn is observed well above Curie-Weiss temperature. As the magnetic field increases the downturn decreases and χ^{-1}_{dc} (T) curve obeys the Curie Weiss law.

Griffith Phase, should be characterized by an exponent less than unity, that is $\chi(T) \propto (T/T_N-1)^{-(1-\lambda)}$ where $0 \leq \lambda \leq 1$.

(ii) In AC magnetic measurement, as the frequency increases, the intensity in both $\chi'(T)$ and χ□ (T) decreases. Also with increase of frequency, the anomaly shifts towards higher temperature.

A steady decay in $\chi'(T)$ is observed in the frequency range 5Hz to 500Hz except the onset temperature, 54K where an increase in slope is observed which is consistent with the onset of GP.

Future Plans:

- We have planned to work in such a system that shows higher magneto electric coupling at room temperature.
- We will work in some other frustrated system to study unconventional magnetic ordering and its underlying physics.

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