Conclusion

In the present work, we have synthesized the Mo substituted Cobalt-Zinc spinel ferrite and studied their structural, dielectric, electrical and magnetic properties. Now we can draw the conclusions of the work as follows:

- Highly pure Mo substituted Co-Zn ferrite was synthesized utilizing the solid state reaction method.
- The XRD patterns confirms the formation of cubic inverse spinel structure with having *Fd3m* space group.
- Both the lattice constant and the crystallite size of the material was seen to be increased with Mo content.
- The variation of dielectric constant with temperature demonstrates that the conduction in CZMO ferrite was because of the thermally assisted dielectric relaxation process. Also the room temperature dielectric constant of pure CZMO was found to be ~485 at 1 kHz, which makes the materials to be used in a super-capacitors.
- The frequency dispersion of dielectric constant can be best illuminated in light of Maxwell-Wagner type of interfacial polarization in agreement with Koop's phenomenological theory.

- All the dielectric dispersion curves were well fitted according to the modified Debye equation suggesting the existence of non-Debye type relaxation mechanism in the material.
- Very small value of dielectric loss tangent have been observed at high frequency and room temperature from the temperature variation of $tan\delta$ plot leads the materials have potential application in high frequency microwave devices.
- Complex impedance spectroscopy shows very high impedance of Mo doped Co-Zn ferrite at room temperature and low frequency.
- Both electric modulus and complex impedance study shows the resistive and capacitive behavior of CZMO.
- The Cole-Cole plot of both impedance spectra and modulus spectra shows the main commitment of grain boundary in the conduction process. Also the existence of non-Debye type relaxation was verified.
- The concrete evidence of presence of non-Debye type relaxation process was found from the scaling behavior of electric modulus and impedance data.
- The activation energy of each sample was estimated from both modulus and impedance spectra and found to be increased with increasing Mo content.
- The conductivity of the sample was contributed by both ac and dc components of conduction.
- All the curves of frequency reliance of ac conductivity satisfy the Jonscher's single power law.

- The temperature variety of conductivity demonstrates the semiconducting behavior of the material. Hence the material can be used as a magnetic semiconductor.
- The activation energy of each sample were calculated in both paramagnetic and ferrimagnetic region and found lower activation energy corresponds to ferrimagnetic state.
- Magnetic Curie temperature was estimated from M-T plot. The T_C for x=0.0 is ~556 K and for x=0.2 is ~570 K. The low values of T_C was due to disorder cation distribution.