

### **Effect of Ni- Substitution on Structural, Magnetic and Dielectric Properties of $\text{KBiFe}_2\text{O}_5$**

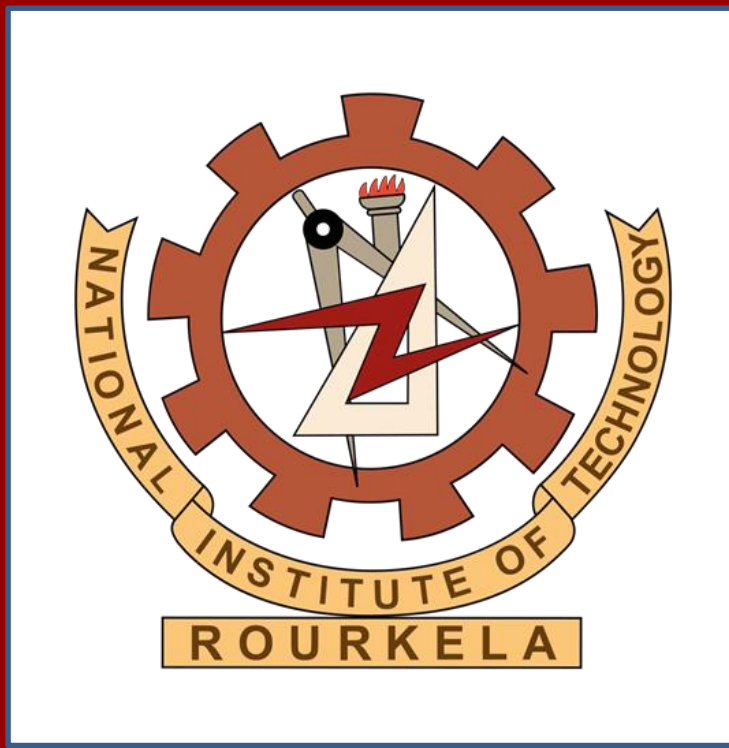
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The influence of Ni substitution on structural, magnetic and dielectric properties of potassium bismuth ferrite ( $\text{KBiFe}_2\text{O}_5$ ) are investigated. Polycrystalline samples of  $\text{KBiFe}_{2-x}\text{Ni}_x\text{O}_5$  ( $x = 0, 0.1$ ) are synthesized by citrate combustion method. For the phase purity of the samples X-ray diffraction is carried out. Based on the refinement result, all the samples are found to be crystallized in monoclinic structure with P2/c space group without any structural transformation. From the M-H hysteresis loop, Ni substituted sample shows enhanced magnetic moment compared to pure compound. The maximum magnetization tends to saturate with Ni doping. Temperature dependent dielectric constant ( $\epsilon'$ ) for both the samples are investigated over a temperature range of 300 K – 773 K. The ferroelectric to paraelectric transition is appeared at around 750 K for  $\text{KBiFe}_2\text{O}_5$  and 705 K for Ni substituted sample. The appearance of magnetic transition in dielectric vs temperature curves give an indirect interpretation of magnetoelectric coupling.





# Effect of Ni- Substitution on Structural, Magnetic and Dielectric Properties of $\text{KBiFe}_2\text{O}_5$

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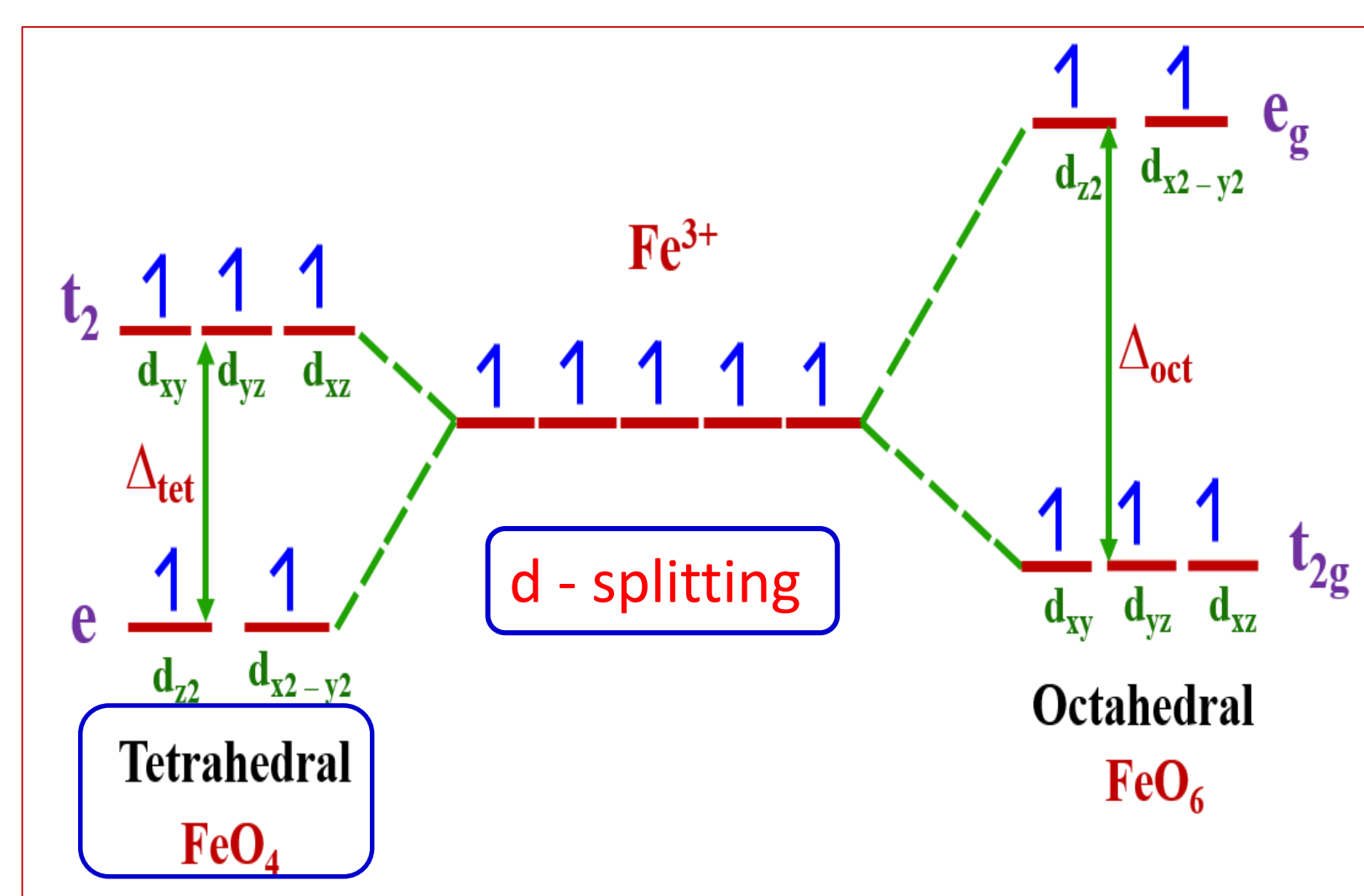
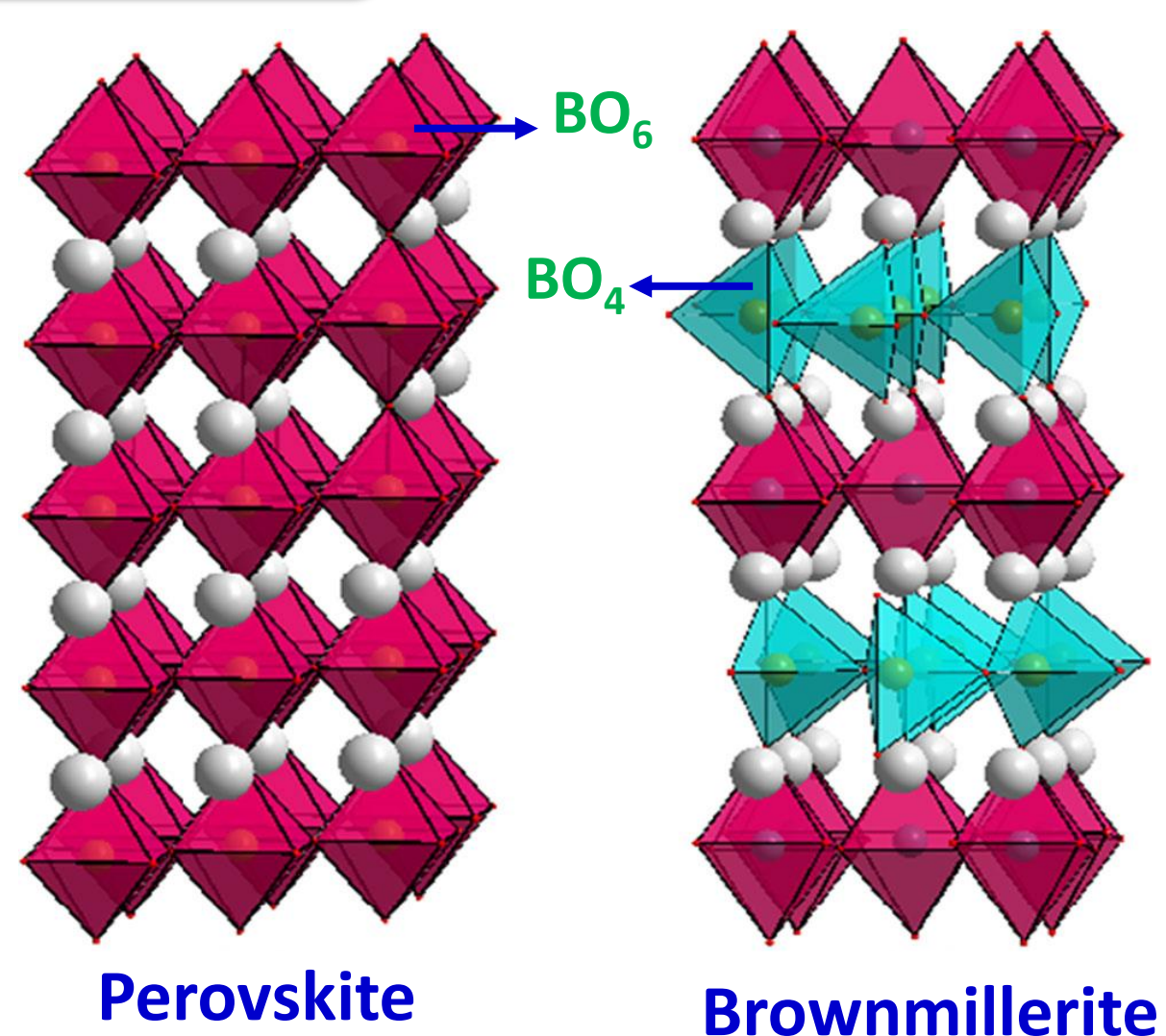
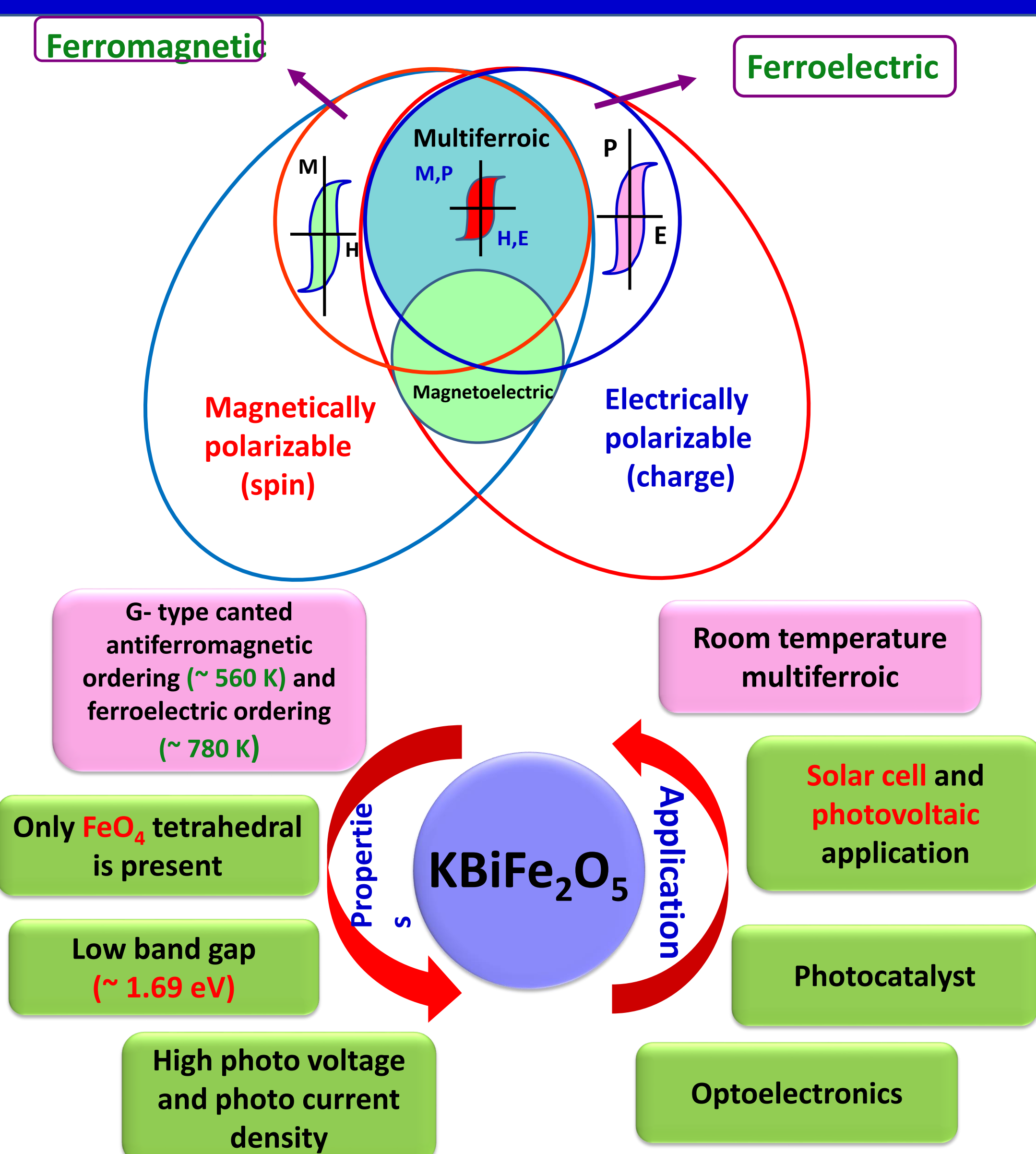
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## ABSTRACT

The influence of Ni substitution on structural, magnetic and dielectric properties of potassium bismuth ferrite ( $\text{KBiFe}_2\text{O}_5$ ) are investigated. Based on the refinement result, all the samples are found to be crystallized in monoclinic structure with P2/c space group without any structural transformation. From the M-H hysteresis loop, Ni substituted sample shows enhanced magnetic moment compared to pure compound. The maximum magnetization tends to saturate with Ni doping. Temperature dependent dielectric constant ( $\epsilon'$ ) for both the samples are investigated over a temperature range of 300 K – 773 K.

## INTRODUCTION

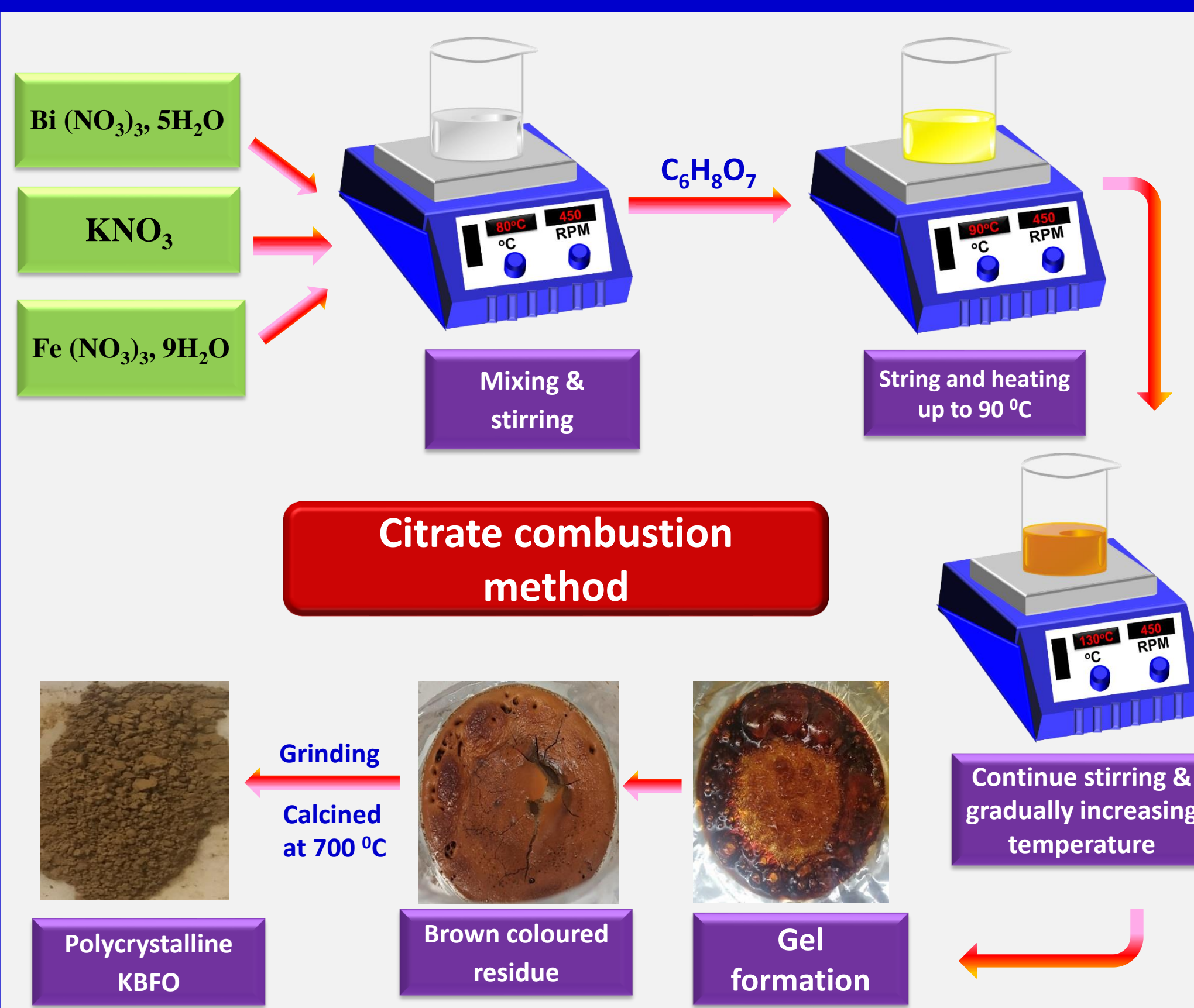


Crystal field splitting energy ( $\Delta$ ) of tetrahedra is smaller than octahedra.

## CHARACTERIZATION

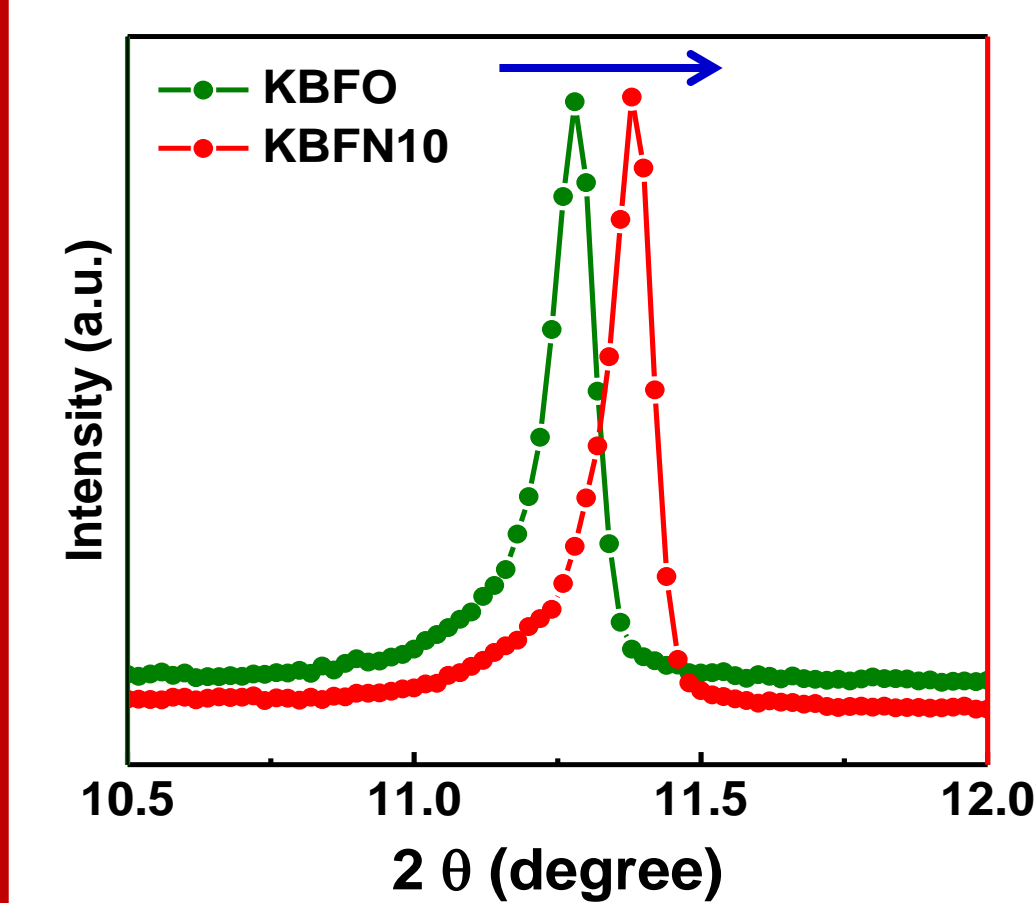
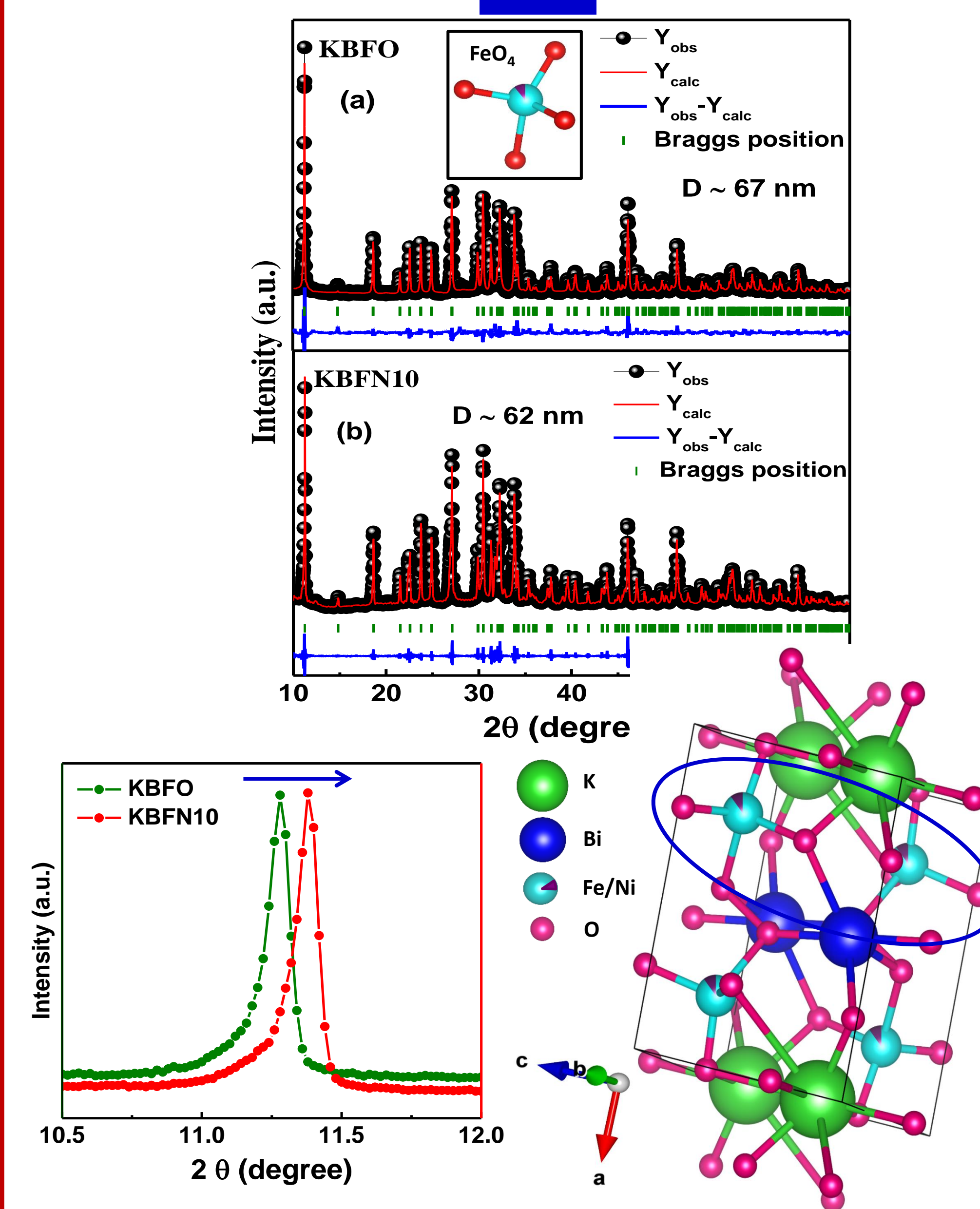
- XRD - Rigaku Ultima IV with  $\text{Cu K}\alpha$ -1.54 Å radiation
- Magnetic study - Vibrating sample magnetometer (Lakeshore 7400)
- Dielectric study - Impedance analyzer (Hioki-IM3570)

## EXPERIMENTAL

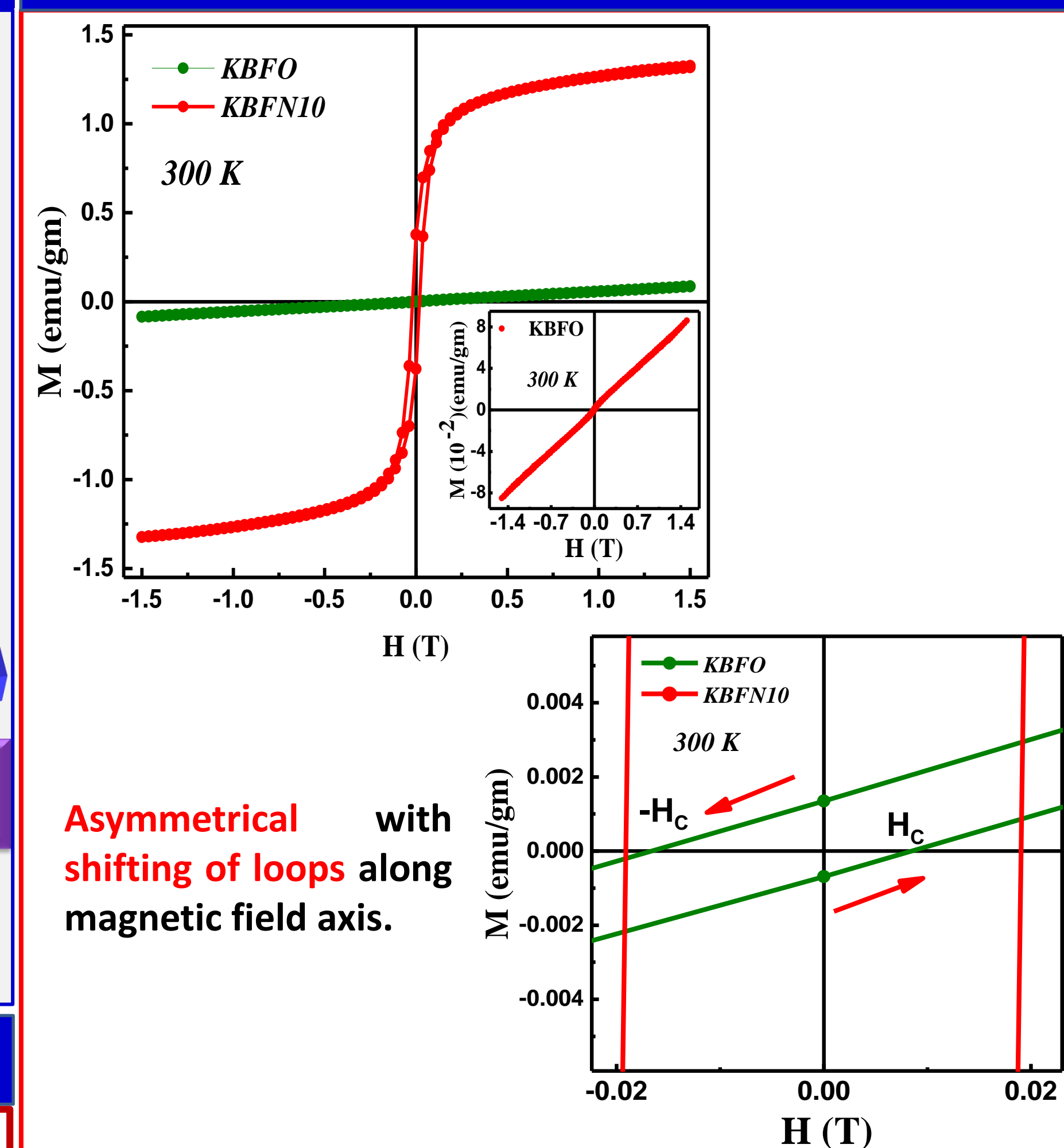


## RESULTS AND DISCUSSION

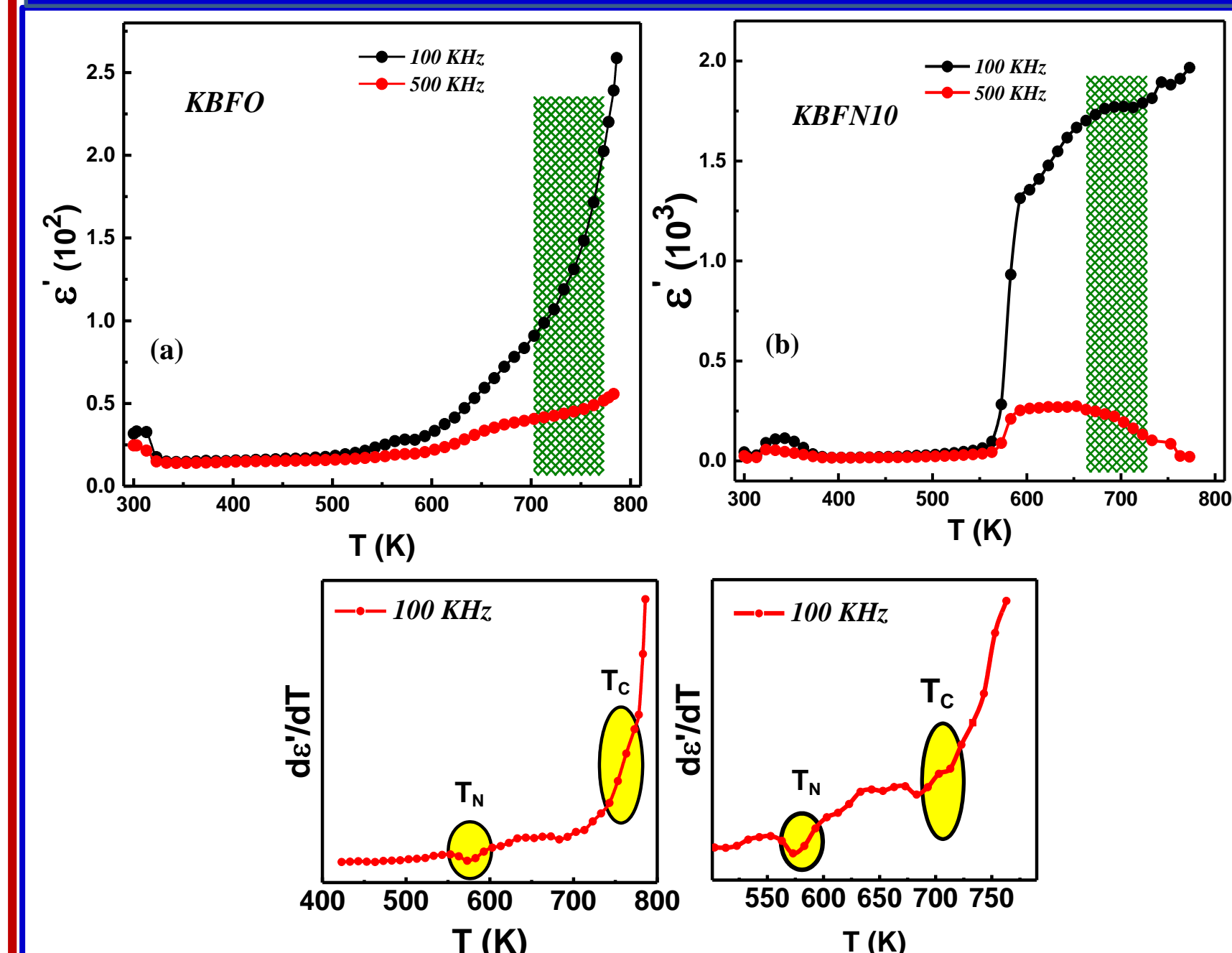
### XRD



## MAGNETIC STUDY



## DIELECTRIC STUDY



The dielectric constant increases with Ni-substitution.

## ACKNOWLEDGEMENT

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## CONCLUSION

- The exchange interaction between Ni-Fe and Fe-Fe ions may enhance the magnetization in KNFN10.
- The appearance of the dielectric anomaly around the magnetic transition above room temperature reflects the existence of ME coupling in the samples

## REFERENCES

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- C. N R Rao, C. R Serrao, J. Mater. Chem., 17, 4931- 4938 (2007).
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- H D' Hondt et al, Chem Mater., 20, 7188- 7194 (2008).

Parameters	$\text{KBiFe}_{2-x}\text{Ni}_x\text{O}_5$	
	x = 0.0	x = 0.1
a (Å)	7.893(4)	7.899(3)
b (Å)	5.972(5)	5.976(6)
c (Å)	5.724(3)	5.728(4)
$R_p$	21.6	12.7
$R_{wp}$	19.6	11.3
$\chi^2$	2.5	5.9
D (nm)	67	62