Title: Multiferroic single phase and composite materials

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Abstract: Multiferroic materials not only exhibit ferroelectric and magnetic properties but also show magnetoelectric (ME) effect, by which an induced electrical polarization and magnetization can be controlled via applying magnetic and electric field, respectively. This effect has potential applications in many areas including information storage, spintronic devices, and multistate memories. $BiFeO_3$ (BFO) has been a prototypical example of single phase multiferroics exhibiting many peculiar properties. In the meantime, co-doping mechanism has attracted great interest on the lines of improving the multiferroic properties of BFO, both in the case of the thin films as well as the bulk ceramics. In the first half of the talk, I will discuss about a systematic investigation of various physical properties of (un-)doped BFO polycrystalline phase ceramics.

Nowadays magnetoelectric composites are being developed to overcome the problems with single phase multiferroics and it has been found that a much stronger ME coupling effect is expected to be realized in a composite of piezoelectric phase and magnetostrictive phase. In this regard, the synthesis and characterization of various magnetoelectric composites of $Ni_{0.75}Zn_{0.25}Fe_2O_4$ as magnetostrictive phase will be discussed. Moreover, to obtain improved multiferroic properties with enhanced magnetoelectric coupling, three phase composites of BFO are being synthesized and their structural, multiferroic, magnetoelectric and optical properties will be discussed in the second half of the talk.