

## Obtention of Multiferroic Ceramics by Coprecipitation. Electrical and Magnetic Response

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The use of multiferroic ceramics or mixed ferroelectric-ferromagnetic systems is nowadays a field of great interest due to the possibility of having double excitation source sensors and actuators. The most widely studied systems belong to the families of cobalt and nickel ferrites combined with ferroelectrics like BaTiO<sub>3</sub> or piezoelectrics like Pb(Zr,Ti)O<sub>3</sub>. One of the main applications for these materials is the magnetoelectricity.

In this work, zinc, nickel and cobalt ferrites, MFe<sub>2</sub>O<sub>4</sub> have been prepared by coprecipitation using cobalt and iron chlorides, and nickel and zinc nitrates as precursors and NaOH as precipitant agent. The ferroelectric phase was commercial BaTiO<sub>3</sub>. The ferromagnetic and ferroelectric phases were mixed to obtain a multiferroic material of composition xFM-(1-x)FE, being FM the ferrite, FE the BaTiO<sub>3</sub> and x=0.2 and 0.4. These mixtures were sintered at 1200°C for 12h and a final density higher than 95%  $\rho_{th}$  was obtained in all the ceramics.

The multiferroic ceramics were characterized by means of XRD, SEM and measuring the piezoelectric coefficient  $d_{33}$  and the magnetization response as a function of the magnetic field  $\alpha_{33}$ . The results are very promising for the nickel ferrite making this material an excellent candidate for multiferroic applications.