SYNTHESIS AND CHARACTERIZATION OF ZN NANOFERRITES

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Fe₂ZnO₄, nanopowders were prepared by hydrothermal method at 160ºC. The structure of magnetic powders were characterized by X-ray diffraction, thermal gravimetric analysis and scanning electron microscopy, while magnetic properties at 300K and 5K were determined by using a SQUID magnetometer working at 100 Oe.

XRD patterns of Fe₂ZnO₄ nanopowder and Fe₂ZnO₄ Franklinite were shown in Fig.1. All the diffraction peaks in the XRD patterns of Fig. 1 can be indexed to face center cubic structure of Iron ferrite, Franklinite, according to JCPDS card No. 22-1012

We can observe for Fe₂ZnO₄ nanopowder low intense and broad diffraction peaks characteristic of low crystallinity and low particle size.

Magnetic characterization of Fe₂ZnO₄ nanopowder obtained by hydrothermal method, Figure 2, shows a characteristic straight hysteresis loop with a saturation magnetic moment of 2 emu at 300K and 8 emu at 5K. These high saturation magnetic moment for this Fe₂ZnO₄ nanopowder are lower than ferromagnetic Franklinite. These results are characteristic of the new superparamagnetic materials.

Fig.3. display the Zero Field Cooling (ZFC) and Field Cooling (FC) curves magnetization measurements of Fe₂ZnO₄ nanopowder shown two broad maximum at temperature as lowest of 21.8K. This may indicate that there are strong interactions between the particles modified by their small size.

High electric resistivity of ceramic ferrites and straight hysteresis loop are interesting for electric power energy transformation due to low parasitic energy lost specially at high frecuency.

References:
Figures:

Fig. 1. XRD patterns of Fe₂ZnO₄ nanopowder and Fe₂ZnO₄ Franklinite.

Fig. 2. Magnetic hysteresis loop for of Fe₂ZnO₄ nanopowder at 5K and 300K.

Fig. 3. Zero Field Cooling (ZFC) and Field Cooling (FC) magnetization measurements of Fe₂ZnO₄ nanopowder.