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## A Comparative Study of Nanoferrites Particles Prepared by a Range of Wet Chemical Method

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**Abstract:** Nickel-Zinc ferrite nanoparticles  $\text{Ni}_{0.5}\text{Zn}_{0.5}\text{Fe}_2\text{O}_4$ , being a novel material for high frequency applications have been prepared by three different methods, hydrothermal, co-precipitation and simplified sol-gel method. The powder X-ray diffraction (XRD) patterns confirm the single phase spinel structure for the as prepared samples. The structural, electrical and magnetic properties of the as prepared samples and the samples sintered at  $555^\circ\text{C}$  and  $755^\circ\text{C}$  were studied respectively. The crystallite size calculated from the most intense peak (311) using the Debye Scherer formula was 9-10nm for the as prepared samples. The crystallite size and saturation magnetization increased with annealing temperature but with different rate depending on preparation method. DC electrical resistivity measurement with increasing temperature was done with two probe method in the temperature range from room temperature to  $450^\circ\text{C}$ . The activation energy and drift mobility were calculated from temperature dependent dc electrical resistivity measurements. Change in the activation energies for all of the samples in different temperature regions was observed showing the dependence on preparation method. The dielectric constant for all the samples has been studied as a function of frequency in the range from 100Hz to 1MHz at room temperature. Vibrating sample magnetometer was used for magnetic properties study. The saturation magnetization for one of the prepared samples, which was prepared by co-precipitation method and sintered at  $750^\circ\text{C}$ , was observed to be 82emu/g. This is the highest value for Ni-Zn ferrites nanoparticles, reported so far, as far as our knowledge is concerned.