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# MAGNETIC AND TRANSPORT PROPERTIES OF $Ni_{0.5}Zn_{0.5}Fe_2O_4$

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## ABSTRACT

$Ni_{0.5}Zn_{0.5}Fe_2O_4$ prepared by solid state reaction method and studied their magnetic and transport properties. Structural properties of the sample have been studied by XRD and SEM. The AC conductivity mechanism is discussed on the basis of a hopping model. The frequency dependent permeability follows the present theoretical models for polycrystalline spinel ferrites whereas the permittivity and conductivity show an anomalous behavior due to an electronic transition in the GHz region. The measured value of the saturation magnetization was 60 emu/gm.

**Keywords:** Ferrite; XRD; SEM; AC permeability; Impedance; permittivity; Conductance;

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## 1. INTRODUCTION

In the soft ferrite industry NiZn ferrite has been a major interest for several decades because of its extensive use in high-frequency transformers and inductors [1], signal transformers, power transformers, pulse transformers, input/output filter chokes [2], deflecting yokes and flyback transformers for TV receivers, antenna rods for radio set [3] and recording heads [4]. Recent interest is focused on the development of miniaturization of electronic components to downsize various electronic equipments and to reduce the weight. Although high-frequency MnZn ferrite is used in most cases to develop mini dc–dc converters and inductors [5] for higher electric resistance exceeding $10^7$ Ω m, NiZn ferrite core of small grain size (under 6.3 μm) is a good candidate in this field too[6]. A recent study by Hua Su et al suggested that the small grain size of NiZn ferrites are more suitable for applications related to low induction or high frequency use [7]. For electronic and magnetic applications which are sensitive to eddy current losses and use moderate permeabilities, NiZn ferrite offers better performance than MnZn ferrites. NiZn ferrite composites are also used for commercial EMI suppression [8]. NiZn Ferrite is a spinel type soft magnetic material combining tetrahedral A site and octahedral B site interactions in a $AB_2O_4$ crystal structure. The compounds which crystallize in the spinel system are formed in either of two structures: the normal spinel or the inverse spinel. The NiZn ferrite consists of a combination of normal and inverse spinels which has very important magnetic properties for applications above 1MHz [9]. In this paper we investigated the AC characteristics, magnetic properties and the microstructure of $Ni_{0.5}Zn_{0.5}Fe_2O_4$.