AP08

Technological Role of Indium in Nickel-zinc Nano Ferrites Synthesized Via Oil-in-water Micelle Technique

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Nano nickel-zinc-indium ferrites ($(Ni_{0.58}Zn_{0.42}In_xFe_{2-x}O_4$, x = 0, 0.1, 0.2, 0.3) with varied quantities of indium have been synthesized by using oil-in-water micelles. The structural properties of nanostructured nickel-zinc-indium ferrite have been investigated by x-ray diffraction, transmission electron microscopy. The permeability and permittivity were measured in the frequency range (0.1-1 GHz). The partial substitution of Fe^{3+} with a small amount of In ions increases the magnetic and dielectric properties, whereas for In>0.1 it slightly decreases the permeability. Sample with x = 0.1 has slightly high $\mu' \approx 1.8$ and controlled dielectric behaviour with low loss properties (0-0.3) in the microwave frequency region makes nanocrystalline nickel-zinc-indium ferrites suitable for high frequency applications. The dielectric loss of the sample with x = 0.1 is only 0.1 at 1GHz. Detail study of x = 0.1 sample show that the permeability increases with increase in ferrite content as compared to eppoxy and also with increase in sintering temperature. The special case of permittivity measurement is examined in detail. High permeability and low dielectric constant and loss can be correlated to small grain size and better composition stoichiometry obtained as a result of processing via oil-in-water micelle technique at low sintering temperature (773 K).

Current interest is to make nanostructured nickel-zinc ferrite, because of its low coercivity [1], high resistivity [2] and saturation magnetization similar to that of magnetite.Van Uitert and co-workers have reported high resistivity and low dielectric loss factors with the incorporation of small amount of trivalent ions in nickel-zinc ferrites. [3-5]The range of loss factor values indicates that the prepared materials suffered very low dielectric losses even at higher frequencies for higher concentration of dopant ions. A very low dielectric loss is one of the characteristic parameters for microwave applications. Microemulsion procedure has been found to be appropriate for the synthesis of nanostructured nickel-zinc ferrite particles with uniform size. Transmission electron micrograph of pure phase ferrite $Ni_{0.58}Zn_{0.42}Fe_2O_4$ shows that particles are spherical in shape and have narrow particle size distribution in the range 8-12 nm [2].

The measured frequency dependence of permeability for four samples under study is shown in Fig. 1.

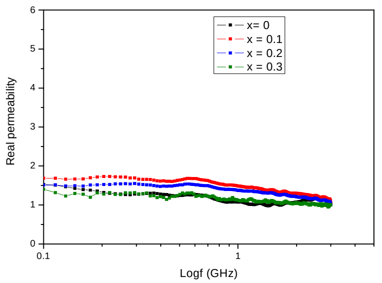

Fig. 1 Variation of real permeability with log frequency

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AP09

Enhanced Performance of MFL Tool by Adopting New Design of Magnetizing System

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ILI(In-Line Inspection) with MFL(Magnetic Flux Leakage) Tool is the best and prevailed technology to inspect integrity of buried pipelines. Strong magnetizing system has been emphasised through the recent studies on MFL thechnology because it can offer some advantages in the view of data analysis[1]. Therefore many vendors of ILI has studied on how to increase the magnetic flux strength applying to the pipe wall. But it has a lot of difficulty in making an applicable magnetizer at field as it needed more spacious volume to make magnetizer stronger and it made a piggablity worse.

KOGAS developed MFL tool named KogasMFL which is adopted the traditional magnetizer system in 2001. The magnetizer system consisted of wire brushes, permanent magnets, spring mounted back-yoke and support wheels. A demand on develpment of new MFL tool was rising after KOGAS finishied fundamental test about its performance in their own pipeline simulation facility. It was demanded that new MFL tool should give a analyzer good quality of MFL data and be accompanied with a good piggablity that a tool can pass throgh tight bend having bend radius ia smaller than 1.5 times of pipe out diameter

Therefoe KOGAS has developed new magnetizer system which can apply strong magnetic flux to pipewall and travel through tight bend at the same time since 2005.

In this paper, we will describe the structure of advanced magnetizer system which applied stronger magnetic flux than previous system by adopting card types of brushes and relocation of permanent magnets and compare results of experiments and FEM analysis of two types of magnetizer system respectively.

As a conclusion, we could see that new developed magnetizer system could get dominant signal than previous system at the same defect. The amplitude of flux leakage by new magnetizer system is about 2.7 times larger than that of previous system. This system showed more enhanced performance in detecting defects than the previous system.

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