CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Ferrites possess both of magnetic and electrical properties, which makes ferrites useful in many technological application. The basic magnetic and electrical properties of ferrites can be modified to the desired application. The modification of ferrites’ properties come in various ways and one of the crucial way in modifying its properties is to use different synthesis methods by optimizing the synthesis parameters (Shinde, 2013).

Magnetite (Fe$_3$O$_4$) and maghemite ($\gamma$-Fe$_2$O$_3$) are presently the fundamental intrigue contrasted with other iron oxides and ferrites. The spinel ferrites can be portrayed by the recipe AB$_2$O$_4$, where A and B signify divalent and trivalent cations, separately. ZnFe$_2$O$_4$ is a typical spinel with all the Fe$^{3+}$ particles in the B destinations and all the Zn$^{2+}$ particles in the A locales, while CuFe$_2$O$_4$ has an opposite spinel structure with the Cu$^{2+}$ particles basically in the B locales and Fe$^{3+}$ particles disseminated similarly between the A and the B site (Singh, et al., 2016).

Meanwhile, the enacted carbon from sawdust were created in a tube heater with the nearness of nitrogen gas. Actuated carbon is imperative microporous adsorbents as a result of its brilliant adsorptive properties, a proclivity for assortment of disintegrated organics and capacity to be specially delivered taking after fancied properties for particular applications (Ismadji et al., 2005).
As of late, activated carbons with extensive particular surface territory are created by synthetic enactment utilizing KOH as initiation reagent. These enacted carbons are relied upon to be a valuable material for the vitality gadget, for example, a gas capacity and electric twofold layer capacitor (Okuma & Horikawa, 2015).

In this research, Cu_{0.2}Zn_{0.8}Fe_{2}O_{4} were synthesized by mechanosynthesis method using ball mill machine with suitable powder to ball ratio. In order to mixed copper zinc ferrite nanoparticle and the sawdust, sol gel method were used with absolute ethanol was used as fuel because of its better completing ability and low ignition temperature (200 – 250 °C) than other fuels used in wet chemical methods (Raut et al., 2014). These synthesized ferrite nanoparticles were then undergoes characterization analysis to study about their structural and magnetic properties.

1.2 Problem Statement

In recent years, the interest in an investigation of nano-size materials has increased due to their physical and chemical properties which are often differ from the bulk counterpart. Nanocrystalline ferrites are as of now the subject of interest on the grounds that a wide application in modern and examination ranges (Sonal Singhal, et al., 2015). The difference in properties of nano-size materials is attributed to increase in surface area along with decreased particle size and various size effect. (Raut et al., 2014).

Due to the large electronegativity of oxygen, the ionic type of bonds prevails in almost all oxide spinels. Soft spinel ferrite (MFe_{2}O (where M = Ni, Zn and Mn), Ni, Zn, Mn,) nanoparticles have been intensively investigated due to their remarkable magnetic and electrical properties and wide practical applications in ferro fluids, magnetic drug delivery, and magnetic high density information storage (Sharma, et al., 2014).
Enacted carbon is a standout amongst the most vital micro porous adsorbents because of its colossal adsorptive limit, a proclivity for assortment of broke up organics and ability to be especially custom-made to suit particular application (Ismadji et al., 2005). Many sorts of materials are utilized as a part of delivering actuated carbon are agribusiness squanders, for example, coconut shell, pistachio shell, saw clean, walnut shell, tropical wood and almond shell which are the most normally utilized (Adinata, 1998). The common field that connected initiated carbon are in waste, water and gas refinement, desulphurization, mercury evacuation and water treatment.

Therefore, in this research, the carbon obtained from sawdust were used as a dopant of copper zinc ferrite nanoparticles. The structural, dielectric and magnetic properties of nano-crystalline carbon dopped copper ferrites were investigated.

1.3 Objectives of Research

Objectives of this research are:

1. To synthesis zinc substituted copper ferrite nanoparticles $\text{Cu}_{0.2}\text{Zn}_{0.8}\text{Fe}_2\text{O}_4$ where $x = 0.2$ by mechanosynthesis method.

2. To produce activated carbon from sawdust with nitrogen gas where carbon acted as dopant to copper zinc ferrite nanoparticle via pyrolysis method.

3. To investigate the structural, dielectric and magnetic properties of nanocrystalline carbon dopped copper ferrites.

4. To investigate the effect of carbon to copper zinc ferrite nanoparticles.