CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF THE RESEARCH

In recent years, there are an extensive study have been carried out on the natural waste and organic substances. The following studies conducted based on their massive criteria such as low-cost, simple fabrication method, high specific properties biodegradable on nature and environmental friendly. There are many example of the organic substances included waste paper, palm oil, rice husk and sawdust. A few researches had been conducted by using agriculture waste and had obtained such a valuable result. Some research carried out in the past used wood ash waste as a replacement for cement in concrete mixed (Halima et al., 2013).

Positive physical properties is some of the advantages utilizing sawdust as a woody biomass in fertilizer assembling for example, high porosity, high water retention, moderate water drainage. Because of their properties, the sawdust had been experienced pyrolysis to end up a carbon black. Different materials are utilized to create carbon black and probably the most usually utilize are agriculture waste, for example, coconut shell, pistachio shell, sawdust, and tropical wood.

Carbon black is one of the most important micro porous adsorbents because it adsorption capacity that is so large, the attraction for several organic dissolved and the capability to custom-tailored the specific application (Ismadji et al., 2005). The term "carbon black" refers to a group of industrial products that involve heat, furnace, channel, and acetylene black. They are fundamentally comprised of basic carbon as round particles close colloidal size, converge into particles and agglomerates and totals got by halfway burning or thermal decomposition of hydrocarbons (Carbon Black: Science and
Activated carbon is likewise utilized as a part of electromagnetic impedance protecting applications, for the most part as conductive fillers in composite materials, because of its electrical conductivity, synthetic resistance and small thickness. Permeation happens at a basic carbon black stacking, called permeation focus, where the initial three-dimensional ceaseless carbon black system is worked all through the polymer grid. The permeation grouping of such blends relies on upon the carbon black structure, the nature of the polymer attributes and the handling techniques and preparing environments. Overall, the conductivity is higher for polymer composites can be obtained by using dark carbon smaller size molecules (surface area is greater), the thickness of the low molecular (porosity higher molecular), higher structure (aggregation better) and volatility low (less chemisorbed oxygen groups) (Dai et al., 2007). Carbon black is generally utilized as filters in plastics, elastomers and paints to change the mechanical properties, optical materials in which it is spread and to determine their application in specific market segments.

Yttrium iron garnet, $Y_3Fe_5O_{12}$ (YIG) is beneficial for the assembly of isolators, circulators, and magneto-optical devices for its tremendous soft magnetic properties at optical frequencies and microwave frequencies. Yttrium iron garnet is widely utilized as a part of microwave devices which is typically prepared by heating a mixture of $Y_2O_3$ and $Fe_2O_3$ above 900 °C for several hours. The technique of synthesized strongly determines the magnetic and structural properties of YIG. There are numerous technique that used to prepare the YIG nanopowders such as organic precursor technique, sol–gel, microemulsion, mechanochemical, hydrothermal and co-precipitation technique.

1.2 PROBLEM STATEMENT

There are some efforts and tests have been committed to produce microwave absorber. There are several issues arise when using inorganic materials, for example, the procedure to generate literal substrate is complex because of many materials needed. It is also very expensive to run this product. Furthermore, the inorganic material is not environmental friendly and can lead to pollution and ecosystem imbalance. The idea started when we realize that natural waste, for example, paper, sawdust and coconut oil
can conquer this sort of issue. Agricultural waste materials will be materials remain in
agriculture field after the yield have been harvest. Part of it was reused in agriculture as
fertilizer creation, while the vast sums remained unused and in some ways represents the
transfer issue. This waste polluting the river through drains and damage to nature when it
produces methane and carbon dioxide. To overcome this issue, this agricultural waste
such as sawdust can be set to be an important item as important as crude palm oil.
Agriculture waste (sawdust) was controlled to be a carbon black by pyrolysis methods
and have a good medium to be used as an electromagnetic wave absorber given the nature
of the carbon material in maintaining the electromagnetic waves. In the application
microwave absorber, carbon has been used as resistance elements in transforming the
microwaves into heat, hence promoting the reduction or attenuation in the reflected
microwave. Adding some rare earth elements and iron can increase the ability of the
material to absorb electromagnetic waves. The aim of this research are to determine the
efficiency of agricultural waste materials to absorb electromagnetic waves. In addition,
new product known as electromagnetic shielding materials made from agricultural waste
materials, rare earth and iron compounds and their composites will be designed. Finally,
to investigate and assess the viability of developing radiation materials for microwave
frequencies protect.

1.3 OBJECTIVES OF RESEARCH

Objectives of this research are:

1. To synthesis carbon black by using pyrolysis technique.

2. To synthesis Yttrium Iron Garnet by using sol-gel technique.

3. To examine structural properties of carbon black doped Yttrium Iron Garnet by
   using Fourier Transform Infrared Spectroscopy (FTIR), X-Ray Diffractometry
   (XRD) and Field Emission Scanning Electron Microscopy (FESEM).