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Enhancement of Thermal Conductivity In Metal Cutting Process Using RGO/CuO/Ag Nano-Fluids By Green-Approach

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ABSTRACT

In this paper we are going to report on Nano-fluids preparation by RG/CuO NPs using the bio-synthesis approach. The RGO is mainly chosen due to its 200 times stronger than other material and it efficiently conducts heat and electricity it is of transparent. CuO is chosen due to its band gap of 2. 1 ev. The bio-synthesis approach is considered as a process because it avoids inert gas, high pressure, hightemp, laser radiation, toxic chemicals, and while comparing to other conventional methods it mainly a vital role in the synthesis of the CuO and it is Eco-friendly , Non-toxic in nature.

Keywords : Bio-synthesis Approach , Nano-fluid, RGO, CuO

I. INTRODUCTION

The Nano-fluids palys an important role in the performance of cooling as a working fluids. In previous works they have worked on the basis fluid adding such as water, ethylene glycol, and propylene glycol these materials have an significant effect on thermal conductivity power[1]. Nano-fluids which represent better thermal conductivity due to its huge surface area to the volume ratio which interfaces the phases of the solid-liquids elements. By this process which turns the nano-fluids to capature heat directly from the source much efficiently when comparing to than that of the single phase fluid elements[2]. There are various matal and metal oxides among them the CuO NPs has been a special choosen due to its efficiency as Nano-fluids in various heat transfer application. CuO has palced a vital role in the water Gas shift Reaction , Stream Reforming[3], in auto-mobiles as an exhaust gases[4]as well as an Photo-Electro-Chemical , Water splitting application[5].

The Base-fluids with carbon Nano-structure like the Graphene, CNT having high ratio will efficiently take place in the transfer of energy resulting in the high heat conduction and improving in the characteristics of convection[6, 7]. In many literature papers they have been a need for Rheological behaviour and the thermal conductivity improving using the Graphene-Oxide and few papers they have worjed on other effects of visicosity amd particle size on thermal conductivity of Graphene-Oxide Nano-Fluids[8].

The preparation of the Graphene is done by Sonification in various coloumns , solvo-thermal synthesis , micro-mechanical methods and chemical Vapour Deposition[CVD][9-13]. By the above process the chemical approach is the best way better and effective way of preparing Graphene-Oxides NPs. The CuO is prepared by Sono-chemicalmethod, sol-gel technique, One-step solid state reaction method at room temperature , Electro-chemical method , thermal decomposition of precious , Wet – Chemically route, alkoxide based preparation, hydro-thermal process , solid-state reaction in the presence of a surfactant[14-17].

II. METHODS AND MATERIAL

A. Characterization

In this the paper the characterization of the CuO is been done by various methods ones they are by the X-Ray diffraction , Ultra-Violet vis spectroscopy , TEM (transmission electron microscopy), FTIR spectra, SEM (scanning electron microscope), PL (photoluminescence's), HRTEM (high – resolution transmission electron microscope) these methods thus the morphology and the structure , size of the element were of been determined[18].

PL (Photoluminescence) analysis of the ZnO NPs-The PL is mainly done for the valued evidence on the purity of the particle as well as for the quality [19].

FTIR (Fourier Transform Infrared Spectroscope)-The FTIR is termed as the Fourier Transform Infrared Spectroscope. This study revolved thus the differential intensity, Zeta potential related to size of the particle and its distributions of the NPs particle [20].

DLS (Dynamic Light Scattering)- The DLS is used for analyzing the quantative size distribution of the particle [20].
SEM (Scanning Electron Microscope)- In this the SEM is used for the determining the particle size of the particle and morphology of the ZnO particles [21]. The samples prepared for SEM were of analyzed by the EDS detector [22].

UV-Visible Spectroscopy- verifying the particle of the NPs the samples was subjected to of the UV-Vis analysis. The reduction of the NPs particle during the process to extract and the filtration of been followed easily of UV analysis [20].

B. Steps for Leaf Extraction from Plants

In this the preparation methods from the plants is done. first of all the leaves which is of been plugged from the plants is of were of washed with the DD water for several times for the removing of the dust particles from the plant[23]. Then the preparation of the extract is of done by placing the required quantity of the leaves in the 250 ml beaker glass laterally with the 100ml of the DD water. Then the amount of about 1:10 proportion of the particle was been taken in a round bottle flask and the process of extraction was done by boiling the water at an arrangement of nearly time duration of 3 hrs by the stirring method [24]. Mixture of the particles were of beam then boiled for merely 20 minutes till the colour changing of the materials takes place. Then the extract has been done under the filtration, centrifugation in order to remove the dust particles and dried using the roto evaporator. After the extract which is of been prepared is deposited in air tight container at an temperature of 4º c [18]. The fig which shows the steps for extraction from plants as in **Fig1**

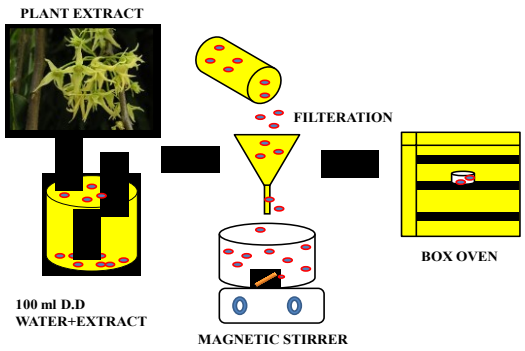

Figure 1. Extracation from plants

C. Synthesis of CuO by using of plants

In this the synthesizing of the process is been carried out by taking all the systematic mark without the additional refining[23]. The CuO Particle which is of been less than 100 nm and the powder (>99%purity, sigma-aldrich)is been used as the marketable nano powder and 3gram of the zinc nitrate hex hydrate [$CuO(NO_3)_2$, $6H_20$] has been dissolved in the 40 ml of the DD water[22]. Then the reactions of the process were done by 25 ml of the crystal apparatus armed with a magnetic stirrer, water condenser, and with the temperature controller under the impressive weight in solvent of free condition[26]. In a short mean of time the extract solution boiled and formed a gel trailed by an decomposition by evolution of gases[27]. Correspondingly the producer has been carried out by compelling 3, 5, 7 ml of the extract from the leaf. Further the product was deposited in a airtight beaker for the further using purpose[9]. The extraction from the plants which acts as an reducing agent for the process as shown in **Fig2**.

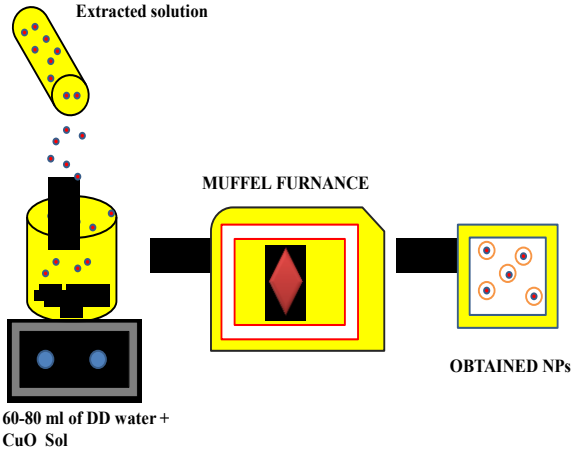

Figure 2. Synthesising from the plant extract

III. RESULTS AND DISCUSSION

A. Preparation of Nano-Fluid

The Nano-fluid was prepared by Two step approach. The preparation of CuO at different volume present concentration they required of the CuO NPs . Thus the CuO NPs was weighted and properly mixed with the 100 ml base fluid and it was mixed and stirred properly. Then the Nano-particles fluid were stirred for an hour using the magnetic stirrer. After that stirring and for better stability and agglemation NPs was sonicated nearly for 45 min using the Ultrasonic Processer at 210v and then continued by U-V irradiation for an hour. Then after that the preparation process the checking of stability of the prepared nano-fluid for the further upcoming days[22].

Anacordium Occidentale Caloropis

Callistemon viminalis

B. Green Approach method for Cutting Tool

Many paper they have reviewed on the Cutting Tool but in our approach we are straight away focusing on Bio-Synthesis approach. By this approach the synthesizing and characterization is of been easily obtained when comparing to the chemical step process. This method is very less toxic in naure, easily done also it avoids inert gas, high pressure, high temp, laser radiation, toxic chemicals, and while comparing to other conventional methods.

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