Thermophysical Properties of Hybrid Nano Fluids

Sandeep Chinta, Sakkirga Mounika, Aravind Reddy

Abstract*: In this study, the ash from agriculture waste of bamboo leaves was used in the synthesis of silica nano particles followed by leaching and acid treatment. The required ash from agriculture waste (bamboo leaves) is subjected to sintered at 700 degree centigrade for 5 hours to eliminate residues from ash. The obtained powder was treated with 1M NaOH for leaching and then acid- treatment with 0.5 M H2SO4 to precipitate pure SiO2 nano particles powder. The synthesized silica were characterized by XRD, FTIR, SEM, PSA, ZETA POTENSIAL. And the synthesis of CuO-SiO_2 hybrid nano fluid from the agriculture waste of silica.

***Keywords* : *Particle size analysing, copper oxide, XRD, SEM, FTIR, silica, sulphuric oxide, Nano particles.*.**

I. INTRODUCTION

Basically nano fluids are used for heat transfer. Understanding is very important while transferring the heat exchange. The research of the nano fluids (or) nano particles is very important. The understanding of the nano fluids mechanism in heat transfer makes promising the heat transfer. The pressure dropping in nano fluids is the main idea of the hybrid nano particles. It also known as the further improvement of hybrid nano fluids.

Nano technology is a science and art of nano particles. The nano scale reading is between 1 to 100000 is the width. Nano materials are tiny in size, surface area also very incredible per unit. These are very strong and less in weight.These are having 500 commercial products and it has 30% cosmetics and it has anti bacterial, bats, golf clubs. Foremost pure liquids, the thermal conductivity can be estimated by using the modified bridge man equation.

$k=2.8\ (N_A/v)^{2/3}\ K\ U$

Where N_A= Avogadro's number

$=6.023*10^{23}$molar program

V=molar volume

k=Boltzmann's constant

$=1.3807*10^{-23}\ m^2kg\ s^{-2}K^{-1}$

U=ultrasonic velocity

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1.1 COPPER OXIDE:

This is a compound of two elements they are copper and oxygen.

COPPER PROPERTIES:

The melting point of copper is 1083.4 +/-0.2^0c

boiling point 2567^0c

specific gravity $8.96(20^0c)$

copper is reddish in colour and takes a bright metallic lustre. Greatest source of cu is minerals like chalcopyrite and bournite.

1.2 BAMBOO LEAVES ASH

The silica content in the bamboo leaves is more when compare to ground nut shell and sugarcane ash. Rice husk has the more silica content in that. In this paper we have to find out the silica content in the bamboo leaves by using that we can make the nano fluid.

II. EXPERIMENTAL PROCEDURE

2.1 SYNTHESIS OF SILICA FROM BAMBOO LEAVES

We can collect the bamboo leaves from bamboo tree and wash cleanly. There are no dust particles on that leaves. We should take 10 grams of bamboo leaves. We placed that bamboo leaves on hot plate and it is sintered at 900 ^{0} c for 7 hours. Later we get the ash from bamboo hot plate. That as is a full of dust particles. We can clear those particles. Later we add 1M of NaOH or sulphuric acid H_2SO_4 to that ash for clearing the dust particles. From that we take 1.77grms of ash for preparing nano fluid.

Pc 2.1 synthesis of silica from bamboo leaves

The chemical equation for getting silica from bamboo leaves is

$$SiO_2\ (ash) + 2NaOH \rightarrow Na_2\ SiO_3 + H_2O$$

The chemical equation is

$$Na_2SiO_3 + H_2SO_4 \rightarrow SiO_2 + Na_2SO_4 + H_2O$$

2.2 COPPER OXIDE (CuO) PREPARATION:

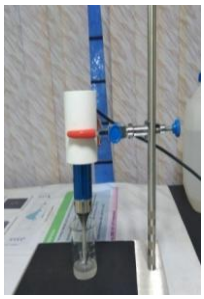
A. For preparing the copper oxide we can take the above prepared nano fluid. We can mix up that fluid to the copper oxide through the particle size analyse machine. Also we mix the little bit of solution to that fluid. The CuO nano fluid is prepared by two step method. In single step it is synthesized by wet chemical process.

$$CuCl_2 + 2NaoH = CuO + NaCl + H_2O$$

Mix up with ethylene glycol taking different concentrations of CuO nano liquids from 0.03 to 0.07 and ultra sonication is taking place for 35 minutes. It may be reduces the thermal conductivity. After that ultrasoniction method no nano particles are observed.

After mixing the nanofluid with copper we have to find out the acoustical properties. Like density, compressibility, intermolecular free length, ultrasonic velocity, intermolecular free length, thermo physical properties such as raos constant, wadas constant, thermal conductivity.

Pc 2.2 mixing of nano fluid with copper oxide



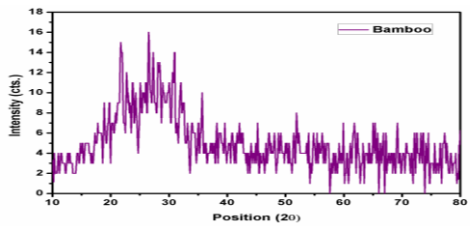
Pc 2.3 probe sonicator

III. RESULTS AND DISCUSSION

From the above content the final results are concluded that thermal and acoustical parameters of nano fluids of bamboo and copper oxide (CuO).

1) XRD(x ray diffraction)
2) PSA (particle size analyser)
3) FTIR (Fourier transform infrared spectroscopy)
4)SEM (scanning electron microscope)

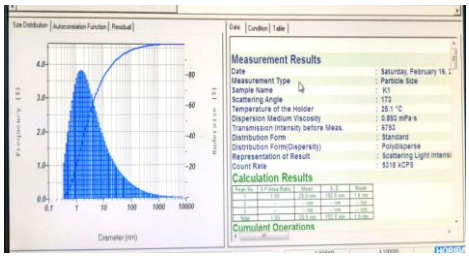
X-RAY DIFFRACTION



Pc 3.1 X-Ray diffraction graph of silica nano particles from bamboo leaf ash

After x ray diffraction the particle of nano size is 25nm and SiO_2 is found

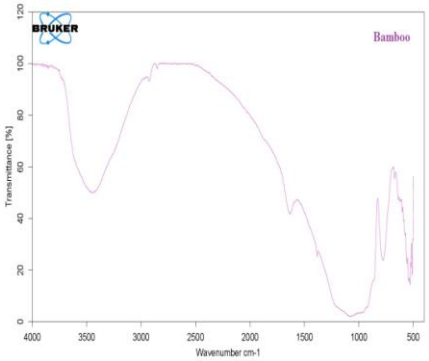
PARTICLE SIZE ANALYSER



Pc 3.2 Particle size analyser of SiO_2 nano particle of bamboo leaf

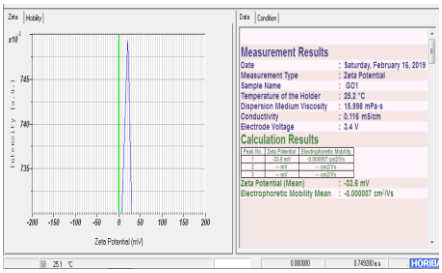
The size this nano particle is 25nm this is a particle size when it is distributed also

FTIRSPECTROSCOPY

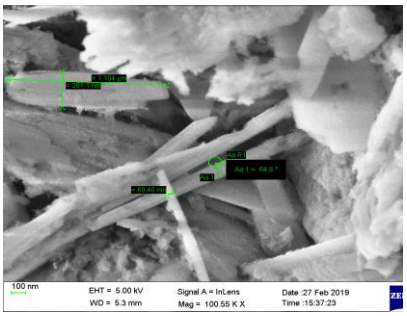


Pc 3.3 FTIR spectroscopy graph of silica nano particles from bamboo leaf

ZETA POTENSIAL



SEM



IV. CONCLUSIONS

Studies of nano fluids reveals high thermal conductivities and heat transfer coefficients compared to those of conventional fluids.

These characteristic features of nano fluids make them suitable for the next generation of flow and heat-transfer fluids.

Pioneering nano fluids research has inspired physicists, chemists, and engineers around the world. Producing silica from the bamboo leaves ash is beat way to produce high quantity of silica.CuO-SiO_2 it revels the acoustical parameters with the base fluid ethylene glycol

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