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Green Synthesis of CuO Nanoparticles using Tea Extract

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Abstract: CuO nanoparticles were prepared by Tea powder extract. The green synthesised CuO nanoparticles was characterized by XRD. The results indicate that CuO nanoparticles synthesised by Tea powder extract has an average particle size of 11nm-28nm.

Keywords*: Green synthesis, Tea powder extract, CuO nanoparticles*.

I. INTRODUCTION

Green Synthesis of metal oxides nanoparticles using plant extract is fable and it leads to green chemistry with less disbursing. Copper(II) oxide is a p-type semiconductor, having an energy gap of 1.2eV with a work function value of 5.3eV. They belong to monoclinic crystal system [1]. There is a rapid growth for the preparation of nanosized metal oxide particles mainly due the extraordinary size-dependent on optical and electronic properties. CuO has an extension range of applications mainly in antibacterial, anti-biotic, catalysis, sensors, dry cell batteries and so on [2]-[6]. CuO nanoparticles was green synthesised and are more environmentally-friendly, non-toxic, and feeble compared to any other conventional methods. In this work, CuO nanoparticles are synthesised using *Tea* powder extract. The particle size, crystal and amorphous nature of materials of particles was studied using XRD characterization.

II. MATERIALS AND METHODS

The Tea powder was purchased from the market. Cupric Nitrate and distilled water was purchased from Merck, India, and was used as purchased without any modification.

A. Green Synthesis Method

10g fine grounded Tea powder was dissolved in 250 ml of distilled water and boiled for 2.5 hours in medium flame and cooled down to the room temperature. The extract obtained was then kept overnight. Copper Nitrate solution and Tea extract was taken in 1:2 ratio and was slowly added to the extract under vigorous constant stirring at 300^0C for 3 hours which gives the brown precipitate. After cooling at room temperature, the extract was filtered using Whatman filter paper and was thoroughly washed with distilled water five-six times to remove any impurities present in it. The collected precipitate was dried in Hot Air Oven for 10 hours at 80^0C and then transferred to silica crucibles and kept in Muffle Furnace for 3 hours at 500^0C. The powder obtained was grinded into fine powder using mortar pestal.

B. Characterization

The CuO nanoparticles were send to SAIF, Kochi, for the XRD characterization. XRD was carried out with Bruker AXS D8 Advance model and Cu Wavelength 1.5406 A° was used with the temperature range of -170 °C to +450 °C.

III. RESULTS AND DISCUSSION

The XRD spectra of synthesised CuO nanoparticles was carried out and resulted 2Theta values ranging from 10^0 to 80^0. The 2Theta values at 28.36, 32.53, 35.56, 38.77, 48.83, 61.61 and 66.29 were observed as shown in Fig.1. The average crystalline size was found to be 11nm and 28nm by using Debye- Scherrer Formula, as shown in Table 1. The peaks obtained with this method was matching with the JCPDS No.80-1268 data, which confirms the CuO nanoparticles.

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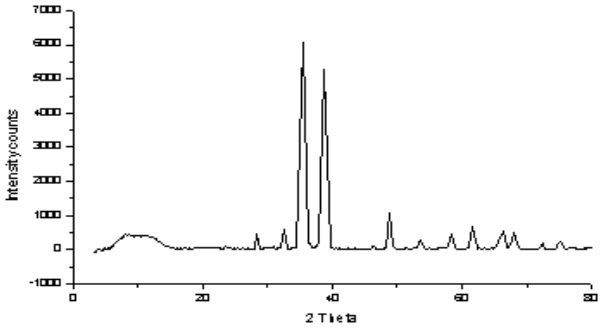

Fig. 1 XRD of CuO nanoparticles

TABLE I Particle size measurements

Peak Position (degree)	FWHM	Particle size (nm)
28.36	0.297	28.80
32.53	0.348	24.83
35.56	0.388	22.45
38.77	0.459	19.16
48.83	0.452	20.15
61.61	0.447	21.61
66.29	0.879	11.27

IV. CONCLUSIONS

CuO nanoparticles was synthesized by the green synthesis method using *Tea* powder extract. The prepared CuO nanoparticles were characterized using XRD. The intensity counts and 2Theta graph was plotted, the peaks obtained from the experiment clearly matches with the JCPDS No.80-1268 data. CuO nanoparticles presence was confirmed. The average CuO nanoparticle size was found to be 11nm - 28nm using Debye- Scherrer Formula.

V. ACKNOWLEDGMENT

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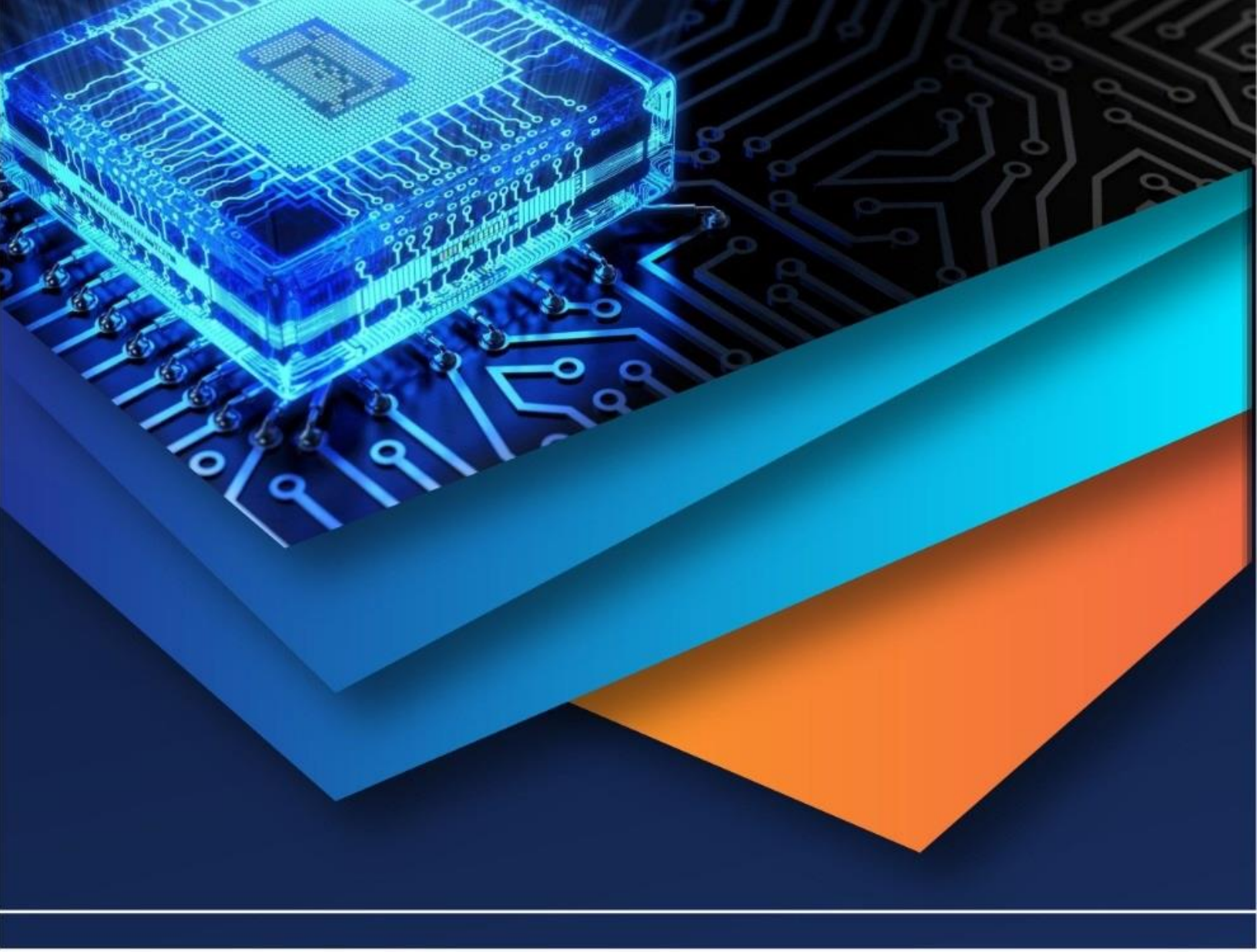

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