Research Article

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Facile Green Synthesis of Carbon Nanoparticles using Medicinally *Murraya koenigii* Shoots

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ABSTRACT

The novel approach for the synthesis of carbon nanoparticles (CNPs) have been employed using naturally occurring and easily available material of *Murraya Koenigii* (curry tree) shoots in the presence of castor oil. The prepared Carbon nano particles (CNPs) were characterised using X-ray diffraction (XRD), Scanning electron microscope (SEM), Fourier transform infrared spectroscopy (FTIR) and Energy dispersive X-ray (EDAX) analysis.

Keywords: Carbon nano particles; Castor oil; *Murraya Koenigii*.

1. INTRODUCTION

The scope of optical sensing has been broadened with the invention of highly fluorescent carbon nanoparticles (CNPs) as the sensing probes (Roshini *et al.* 2015). Recent discoveries confirm the feasibility of this technology in humans. Surface functionalized nano particles allow for the particles to be preferentially adsorbed at the surface interface using chemically bound polymers. The natural organic dye to the recent semiconductor nanoparticles, the researchers have experimented with various advances in this area. Carbon nanoparticles are great interest for fundamental studies and practical applications. CNPs have been widely used in super capacitors (Umesh Kumar Parida *et al.* 2011; Virender K. Sharma *et al.* 2009; Wenbo Lu *et al.* 2012; Imtiyaz Hussain *et al.* 2016; Zhengsong Lou *et al.* 2014). The latest one among them was the use of semiconductor nanoparticles which shows some remarkable properties like high emission quantum yields, size-tuneable emission, chemical and physical stability, narrow spectral bands, possibility of surface modification for a specific sensing application, etc. Various efforts were carried out to synthesise CNPs from natural precursors. Synthesis of CNPs from naturally occurring and economically viable molecular precursors and their promising application towards various fields are important areas worth looking at. Nano Carbon Particles are also available in passivated and ultra high purity and high purity and coated and dispersed forms. They are also available as dispersion through the AE Nanofluid production group. Nanofluid dispersion and coating selection technical guidance is also available. Other nanostructures include nanorods, nanowhiskers, nanohorns, nanopyramids and other nanocomposites. Carbon Nanoparticles have found novel application in cancer treatment using radio waves to heat and destroy a tumor, lymphoma, or metastasized cancer (Monaliben Shah *et al.* 2015).

Studies reveal that cancer treatement using radio waves can heat and destroy a tumor, lymphoma or metastasized cancers . But they suffer from the serious limitation of major health problems caused by the toxic effect of the heavy metal elements from which they are produced. In this scenario, the CNPs are beginning alternative to semiconductor nanoparticles. Apart from the high photo stability and lack of any cytotoxicity,the, the size and the excitation dependent photoluminescence are the versatile characteristics of these carbon nanoparticles (Lina Wu *et al.* 2013; Zixuan Zhan *et al.* 2016; Poovathinthodiyil Raveendran *et al.* 2003). Carbon has been fascinating to scientists for centuries and still remains to intrigue the scientific community in the form of nanometer sized allotropes such as bucky balls and just more just in the form of ideal atomic layer, graphene (Zixuan Zhan *et al.* 2016). Carbon (c) nanoparticles, nanodots or nanopowder are black spherical high surface area graphitic carbon. These particles can be used in humans and also used to develop high-capacity lithium sulfer-nanocarbon electrode which allows the battery cell to leaverage the high lithium storage capacity of sulphur atoms, whilst maintaining high electron mobility through the carbon nanoparticles matrix (Zixuan Zhan *et al.* 2016; Poovathinthodiyil Raveendran *et al.* 2003). The CNPs were prepared from a bio-precursor which is economically cheap and naturally abundant. The conversion method involved were simple thermal pyrolysis without any passivating or stabilizing agents. The synthesized CNPs were characterized using XRD, FTIR, SEM with EDAX analysis.

2. MATERIALS & METHODS

2.1 Materials

Murraya koenigii were collected in and around erode city, India. Castrol oil was purchased from local market. Toluene and acetone were purchased from Qualigens chemicals. All chemicals were used as received. All solutions and suspensions were prepared using deionized water.

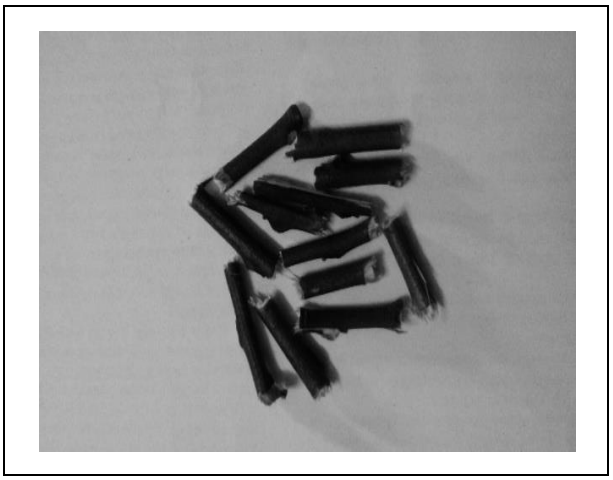

Fig. 1: Murraya Koenigii dried shoots.

2.2 Methods

2.2.1 Drying of shoots

Around 10 g of *murraya koenigii* shoots were cut into pieces and cleaned with distilled water for four times. Further, the shoots were kept in an oven at 80 °C for 20 hrs. The dried shoots were used for further studies.

2.2.2 Preparation of carbon nanoparticles using castor oil

The dried shoots were soaked in 15 mL of castor oil in a beaker for 1hr. Then, the shoots were taken out to remove excess oil. The shoots were then burnt using a candle with a steel plate placed over the shoots to collect the particles coming out of the flame. The process is continued until the black fumes get completely stacked at the vicinity of the steel plate. The steel plate was then allowed to cool for about 20 min and the black powder stacked over it was collected.

2.2.3 Purification of CNPs

The black mass so obtained were grained to powder using mortar and pestal the obtained powders were washed with toluene, acetone and deionized water to remove soluble organic by-products. The resultant black powder was centrifuged and subsequently dried. The dried powders were collected and termed as (CNPs) carbon nano particles. The obtained CNPs were used for further characterization studies.

3. CHARACTERIZATION OF CNPs

3.1 X-Ray Diffraction

The structural parameters of the prepared CNPs were characterised using x-ray diffraction. The XRD measurements of the CNPs were done using XPERT-PRO, Netherland. Instrument operating at the wavelength (ʎ= 1.541Å) with cu-kα radiation.

3.2 Fourier Transform Infrared Spectroscopy

Functional group analysis of the CNPs was characterised using FTIR spectrum with spectral range of 4000-400 cm^{-1} using KBr pellet.

3.3 Scanning Electron Microscope & Energy Dispersive X-Ray Spectroscopy

The scanning electron microscopic (SEM) and energy dispersive x-ray spectroscopy analysis of the prepared CNPs was done using JEOLJSM 6390 machine.

4. RESULTS AND DISCUSSION

4.1 X-Ray Diffraction

Fig. 2 shows the XRD pattern of as synthesised CNPs. The XRD spectra exhibit sharp intense peaks at 2Θ=20.2°, 22.8°, 27.6°, 44°, 64.3°, 77° and weak peak at 42 °[1, 11]. The peak observed at 22.8°(022) and 42°(101) corresponds to graphitic carbon diffraction pattern. The average crystallite size is 29.67076 nm (calculated using Debye scherrer'sformula). The sharp peaks revals that the synthesised sample contain crystalline in nature (Imtiyaz Hussain *et al.* 2016).

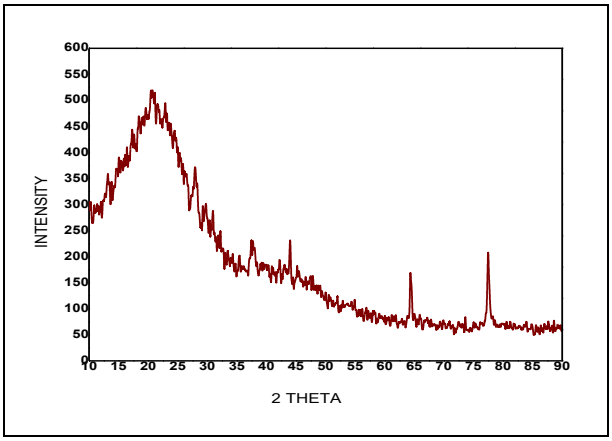

Fig. 2: XRD spectra of CNPs.

4.2 Fourier Transform Infrared Spectroscopy

The peaks observed at 3759 and 1564 cm^{-1} corresponds to –OH stretching vibration mode (Roshini *et al.* 2015). The peak observed at 1693 cm-1

corresponds to Asymmetric stretching vibration of COO- . C-OH strectching band observed 1111 cm^{-1}, C-H strectching mode observed at 2365 cm^{-} (Virender K. Sharma *et al.* 2009;). The band observed at 729cm^{-1} attributed to C-H out of plane bending mode (Virender K. Sharma *et al.* 2009; Lina Wu *et al.* 2013). The observation exhibits that the synthesised sample contains hydroxyl and carboxylic group of carbon.

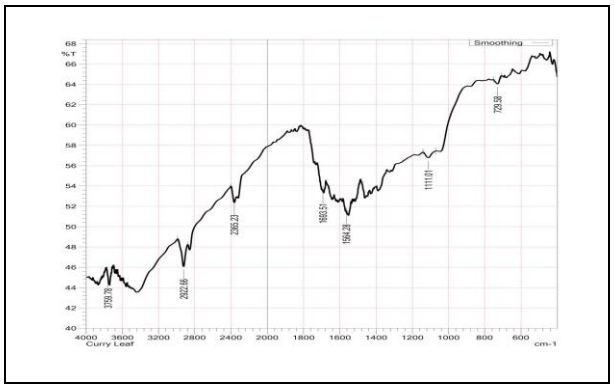

Fig. 3: FTIR spectrum of CNPs.

4.3 Scanning Electron Microscopy

Fig. 4 shows the surface morphology of the synthesised CNPs at different resolution.

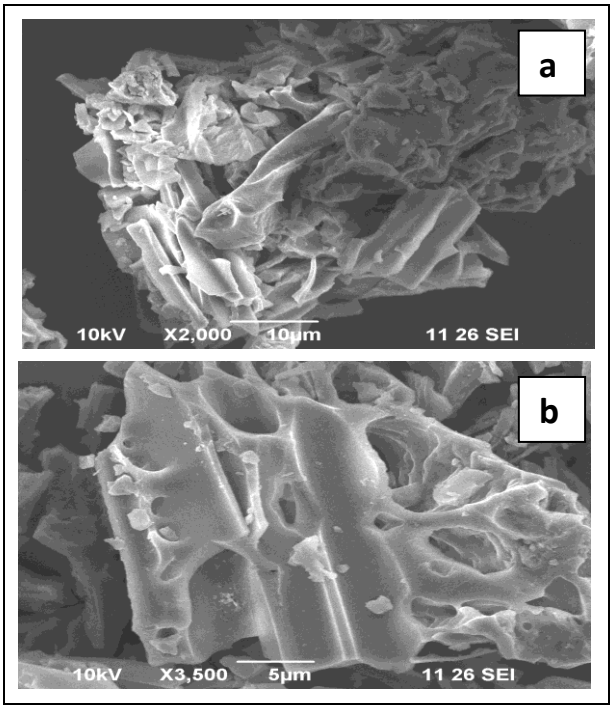

Fig. 4: (a & b) SEM image of synthesized CNPs at different resolutions.

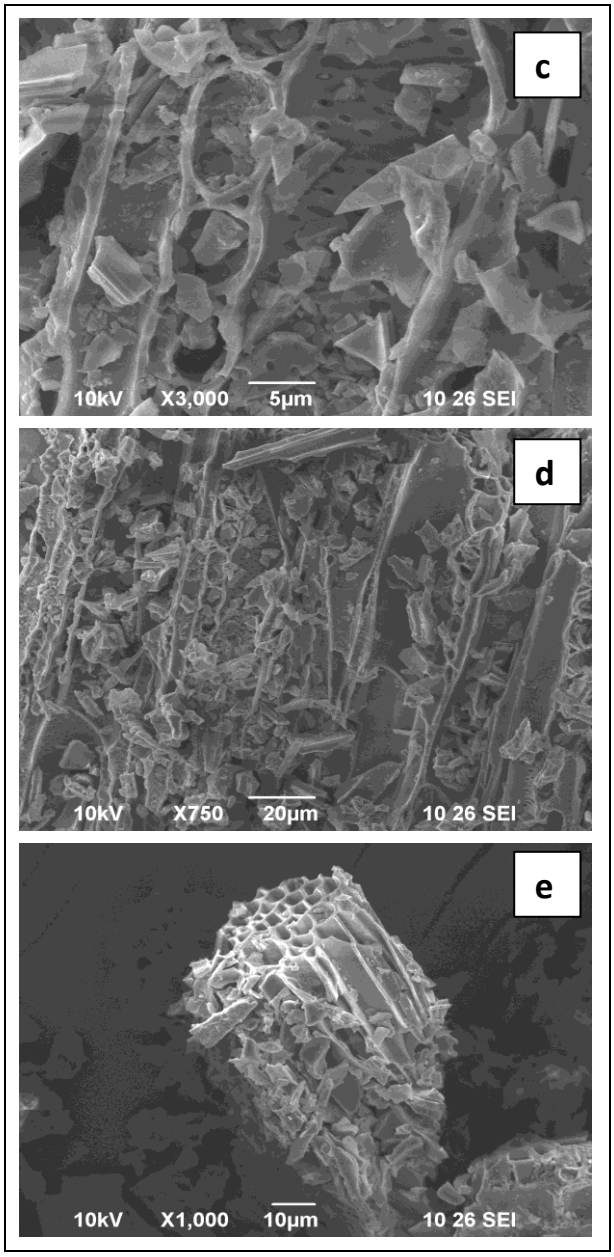

Fig. 4: (c, d & e) SEM image of synthesized CNPs at different resolutions.

The morphology of prepared CNPs were honey comb shaped and well dispersed in aqueous solution with uniform size (Imtiyaz Hussain *et al.* 2016; Naveen Prasad *et al.* 2016).

4.4 Energy Dispersive X-Ray Spectroscopy

Fig. 5 exhibit the elemental composition of CNPs. The spectra reveals the presence of C, Ca, K, Mg and O (Naveen Prasad *et al.* 2016).

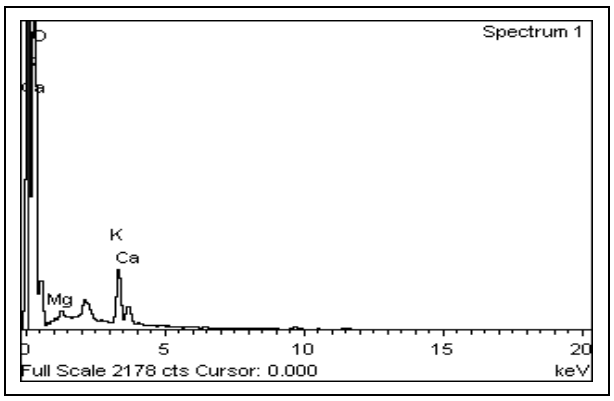

Fig. 5: EDAX spectra of CNPs.

5. CONCLUSION

CNPs were synthesized by a low cost, green and convenient method. An economical method to synthesize CNPs with unique properties is very important environmentally. The results suggest that this methodology could provide an easy and lower cost technique for producing carbon nanoparticles and murraya koenigii shoots can be used as an Alternative raw material for the production of carbon nanoparticles.

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CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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