International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Impact Factor (2012): 3.358

An Experimental Study of Carbon Dust

Dr. Rohini V. S.

Associate Professor, Department of Physics, Nrupatunga University, N T road, Bangalore-560001. Karnataka, India
neelarohini[at]gmail.com

Abstract: ***Carbon quantum dots (CQDs) are a replacement class of carbon-based nano material and CQD are small carbon nano particles smaller than 10 nm comprising distinctive properties due to their diverse physicochemical properties and favorable attributes like good biocompatibility, unique optical properties, low cost, ecofriendliness, high stability, CQDs have the specified advantages of low toxicity, environmental friendliness low cost and straightforward synthetic routes. Moreover, surface passivation and functionalization of CQDs leave the control of their physicochemical properties. Since their discovery, CQDs have found many applications within the fields of chemical sensing, biosensing, bioimaging, nanomedicine, photocatalysis and electrocatalysis. this text reviews the progress within the research and development of CQDs with a stress on their synthesis, the target of this work was to consolidate the present literature on the synthesis, characterization techniques, and biomedical natural resources applications of CQD. Using electrochemical oxidation, combustion/thermal, chemical change, microwave heating, arc-discharge, and laser ablation procedures from various natural resources, the paper shows recent developments in the synthesis, functionalization, and technical applications of carbon quantum dots. Natural carbon sources are used to make CQDs because they are inexpensive, environmentally friendly, and readily available.***

Keywords: Carbon quantum dots, HCQD-hydraulic CQD, carbon dots, photoluminescence

1. Introduction

Carbon quantum dots (CQDs, C-dots, or CDs) are small carbon nanoparticles with some type of surface passivation (less than 10nm in size). CQDs inherit the strong optical qualities of classic semiconductor quantum dots while also compensating for their shortcomings in terms of cytotoxicity, environmental, and biohazard. CQDs also have strong water solubility, chemical stability, photobleaching resistance, and are simple to surface functionalize and prepare on a wide scale. Since its discovery in 2004 by researchers,

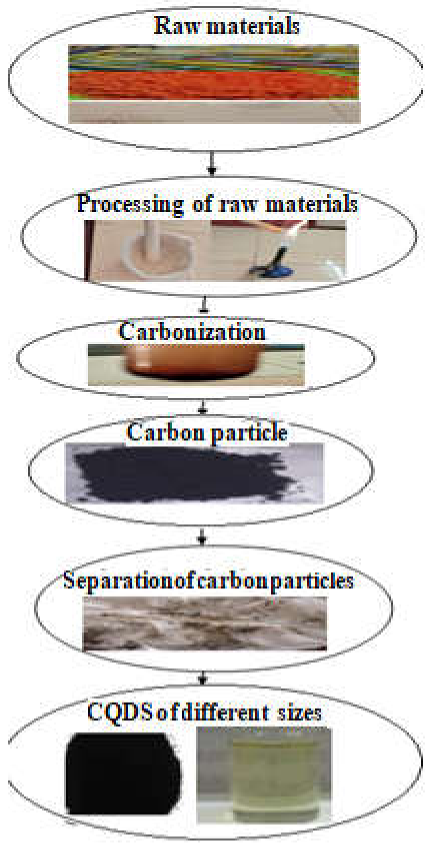
Quantum dots are semiconductor particles that are only a few nanometers in size. When a current is supplied to QD or they are exposed to light, they emit light of a specified wavelength. Nanoparticles are tiny structures that are larger than QDs, ranging in size from 8 to 100 nanometers. CQDs have extremely strong and controllable fluorescence capabilities, allowing them to be used in biomedicine, optronics, sensing, and catalysis. It exhibits good photostability, a small size, highly controllable photoluminescence (PL) properties, biocompatibility, electrochemiluminescence, and superb multi-photon excitation. These materials can be functionalized with biomolecules and are less toxic and chemically inert, making them useful as drug delivery and imaging carriers. CQDs are also useful in sensors, optoelectronics, and electrochemical luminescence.

CQDs are made from natural resources such as vegetables and fruits such as sugar, cane juice, oats, carrot and sugar in this case study.1st order magnification was used to identify HCQDs of the order 4500, 1030, 600 m, while 2nd order magnification was used to identify HCQDs of the order 3.125, 7.152, 4.1667 nm. The magnification methods were used to identify CQDs of the order 1400m and 0.9722 nm.

CQDs can be used for a variety of medicinal and biotechnological purposes, including for drug delivery, Biosensors-Biosensors are a type of biosensor, Cell imaging—this is the imaging of live cells, Biomedical imaging-processing of biomedical images, Treatment with a specific goal in mind, Assay for bio analytical purposes, Cancer diagnosis/treatment, chemical sensing, biosensing, bioimaging, nanomedicine, photo catalysis and electrocatalysis.

2. Methodology

Green synthesis of CQDs (using natural resources) block diagram



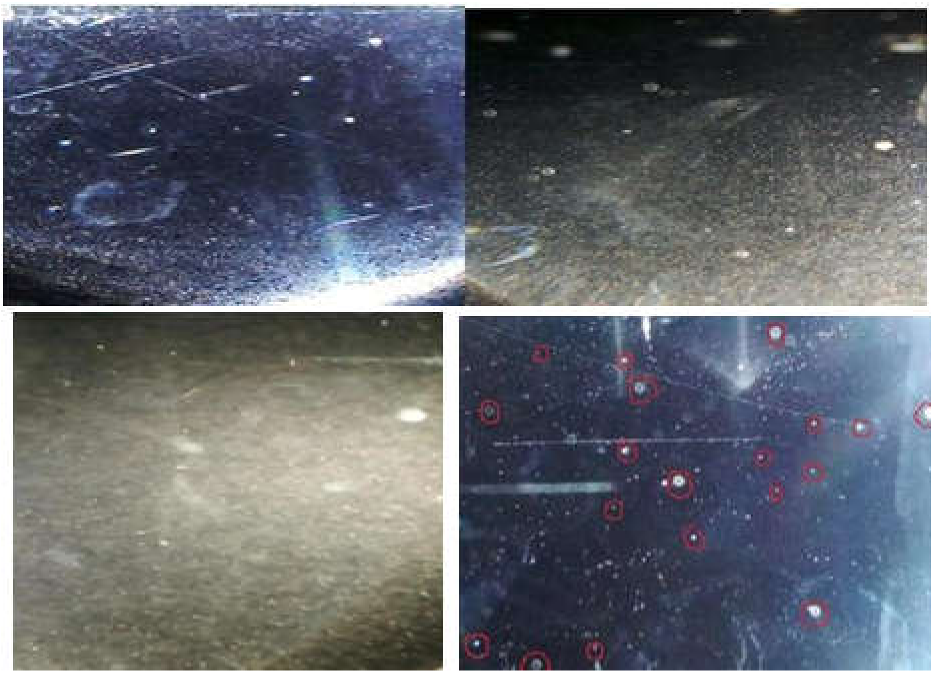
3. Preparation of CQDS

The natural resource is subjected to cutting, grinding, low flame hydrothermal heating, processing in a micro-furnace and high temperature charring until it is converted into fine carbon powder. This powder is filtered through a carbon filter and the carbon powder from different carbon grains is separated on filter paper as shown below. The natural resource used is sugar cane, oats, carrots and sugar.

4. Identification of HCQDS

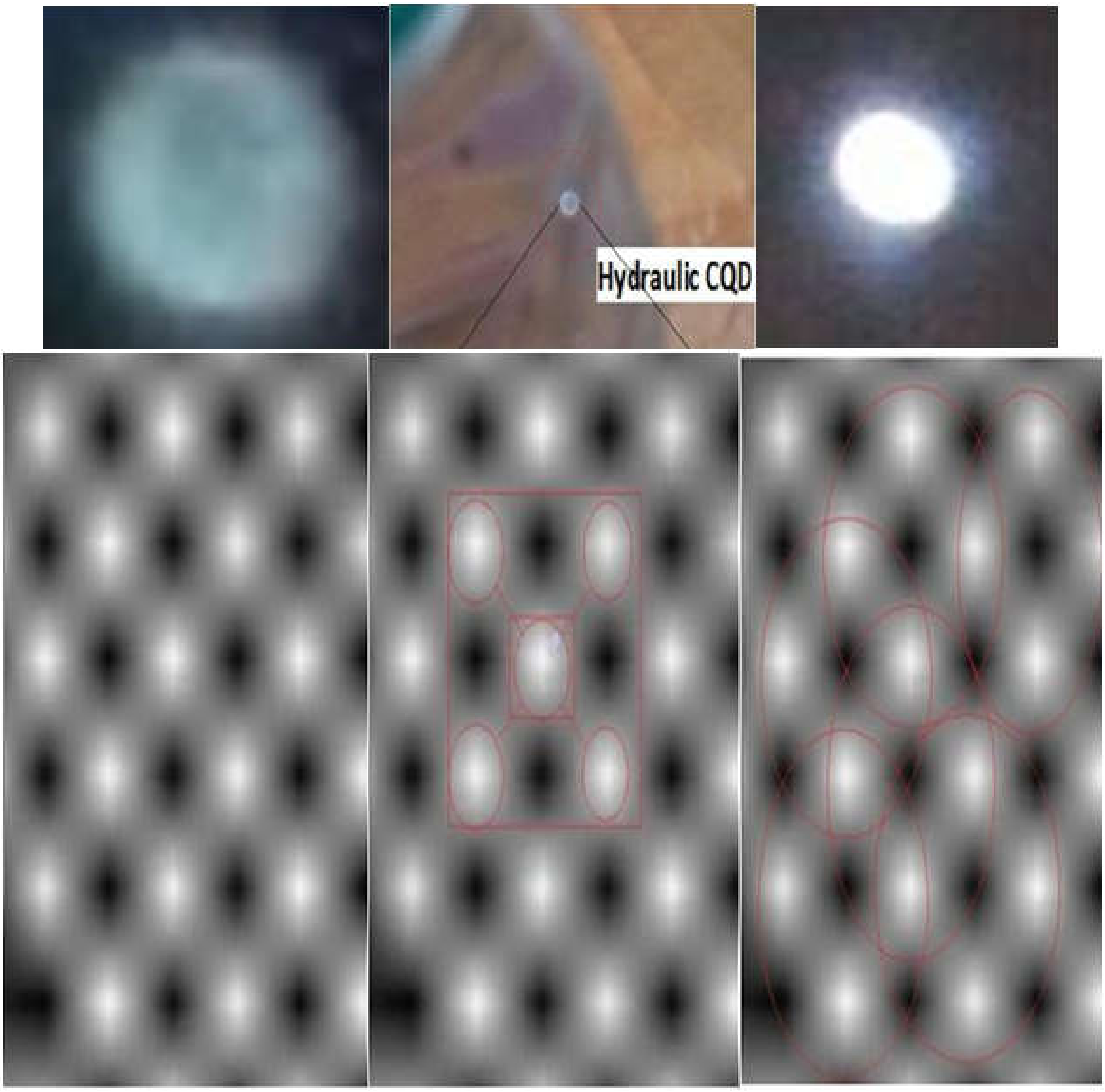
When the carbon samples thus prepared are mixed with distilled water, they are found to form hydraulic carbon quantum dots (HCQD). Hydrated carbon sample showing photo luminance with white light. and their special features are studied.

Hydrated carbon sample

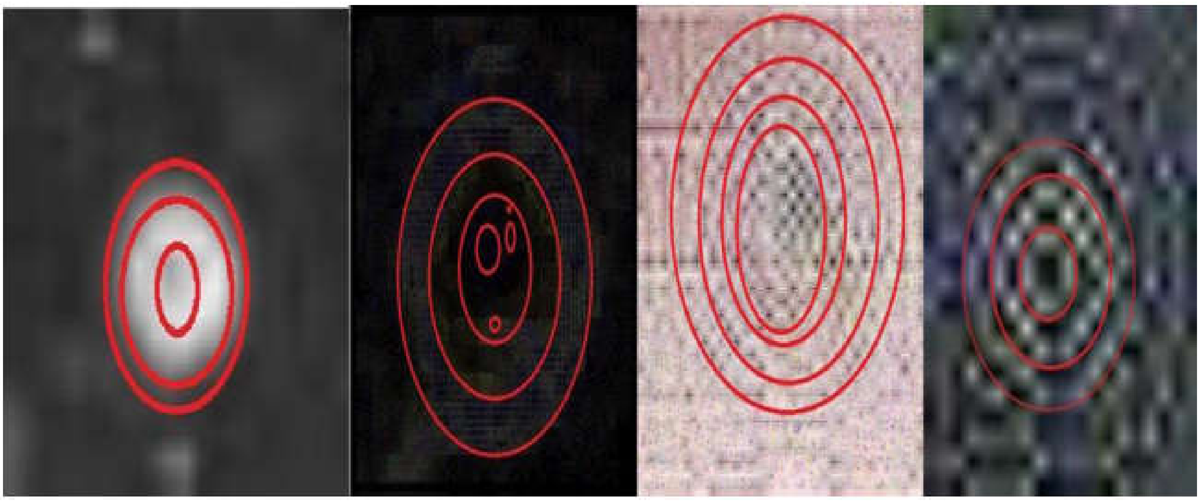


International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Impact Factor (2012): 3.358

When illuminated with white light tiny balls are seen floating / circulating in the water which are HCQD. An enlarged view of a single bale is displayed. When the surface of this HCQD is enlarged and visualized, it looks like this. An enlarged HCQD shows ring-shaped structures. The higher order magnification of HCQD shows the above structures, a regular pattern showing the structure of triclinic.

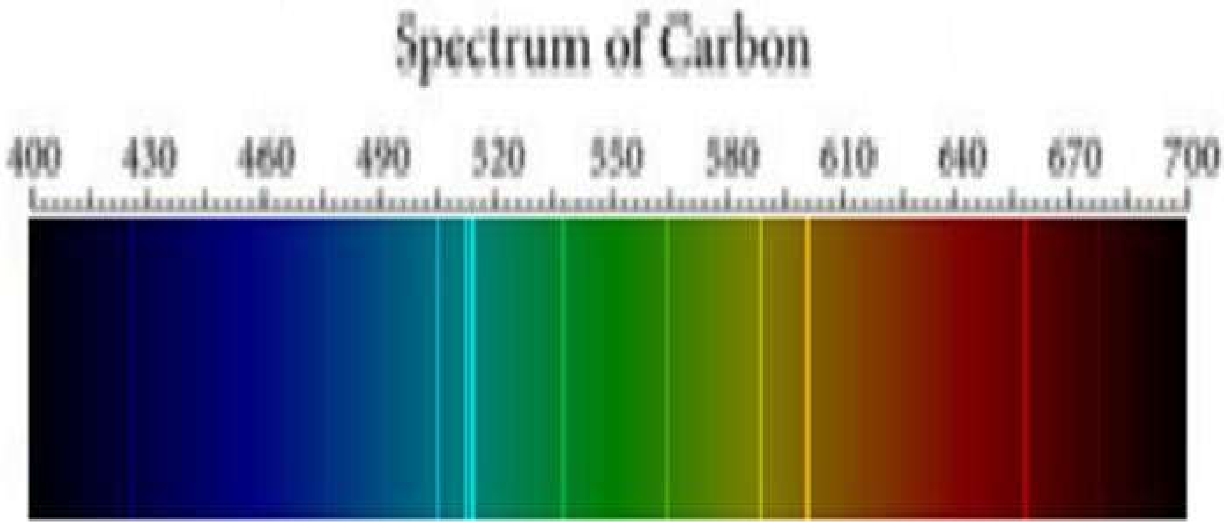


Coordination number 4 identifies the species as carbon



Magnified Image of Surface of a HCQD

Photoluminence-statistical analysis[7] of CQDS shows that **G_1> G_2 > Y> O> R,** Statistical analysis of multi-wavelength CQD images shows maximum emission / absorption in the green wavelength 565 nm



5. Conclusions

Therefore, CQD and HCQD are successfully prepared and their physical, structural, spectroscopic and statistical properties are studied. CQD and HCQD are successfully prepared and their physical, structural and spectroscopic properties are investigated. identify CQDs in micrometric ranges. The CQDs essentially show the tricline structure, the covalent bond, the coordination number 4. These wavelengths correspond to the Raman lines, the lines of the Frounhoffer carbon. Statistical analysis using the first magnification method provides a correlation of the spectral intensity distribution of CQDs like G_1> G_2 > Y> O> R for **green1 (538 nm), green2 (562 nm),** orange (601 nm)), yellow (589 nm), red (658 nm). **Green emission by carbon dust has got special significance with solar coronal green line emission. An investigation is under process to identify the green emission is because of carbon/iron.**

References

[1] Carbon quantum dots from natural resource: A review Rashmita Das, Rajib Bandyopadhyay, Panchanan, Pramanik https://doi.org/10.1016/j. mtchem.2018.03.003/2468-5194/©2018 Elsevier Ltd. All rights reserved

[2] Green synthesis of fluorescent carbon dots from carrot juice for in vitro cellular imaging Yang Liu1, Yanan Liu1, Mira Park2, Soo-Jin Park3, Yifan Zhang3, Md Rashedunnabi Akanda4, Byung-Yong Park4 and Hak Yong Kim *Carbon Letters Vol.21, 61-67 (2017)* /DOI: http: //dx. doi. org/ 10.5714/CL.2017.21.061

[3] Carbon quantum dots from natural resource: A review Rashmita Das, Rajib Bandyopadhyay, Panchanan Pramanik, Materials Today Chemistry© 2018 Elsevier Ltd. All rights reserved.

[4] Aqueous Carbon Quantum Dot-Embedded PC60-PC61BM Nanospheres for Ecological Fluorescent Printing: Contrasting Fluorescence Resonance Energy Transfer Signals between Watermelon-like and Random Morphologies-Yu Jin Kim, Peijun Guo Richard D. Schaller/October 9, 2019/

[5] https://doi.org/10.1021/acs.jpclett.9b02426/**Copyright © 2019 American Chemical Society**

[6] Jaimy Scaria, M. Suresh Kumar, inNano-Materials as Photocatalysts for Degradation of Environmental Pollutants, 2020

[7] The enhanced coronal green line intensity and magnetic field gradiants-Journal of Astrophysics and astronomy (2000) 21, 419-420, K B Ramesh, B S Nagabhushana and B A Varghese

[8] Optical characterization of carbon quantum dots by-IJSR, Dr Rohini V S