

Synthesis of Carbon Quantum Dots by Amla (*Phyllanthus Emblica*) Extracts

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Abstract- Carbon nanoparticles less than 10 nm. Which are generally small size carbon quantum dots. Carbon quantum dots with special properties have generally become a new nano carbon member. In this paper we have prepared carbon quantum dots by hydrothermal method using the extract of amla fruit used as a carbon source and liquid ammonia as a solvent. The carbon quantum dots which is prepared by hydrothermal method is analysed by UV and IR spectroscopy.

I INTRODUCTION

Amla is the most extensively studied plant. Reports suggested that it contains tannins, alkaloids, and phenols. Fruit contains 28% of the total tannins distributed in the whole plant. Fruit contains two hydrolysable tannins, Emblicanin A and B, which have antioxidant properties. The amla fruit is quite fibrous and has a sour and bitter taste. The fruit contains phyllemblicin activity. Directed fractionation revealed the presence of several phytochemicals like quercetin, alkaloids like phyllantin and phyllantidine are found. In India, amla is commonly used as a diuretic, liver tonic, refrigerant, an antipyretic, hair tonic, an ulcer preventive, and for treatment of common cold.

Amla extract is used as a carbon source and ammonia solution. Without adding any surface passivating agent, hydrothermal carbonization takes place. Ammonia was added in an acidic medium to improve the photophysical property of CQDs.

Experimental Method:- Materials and Method -

1. P. emblica (amla) powder - 5 gm
2. Aqueous Ammonia - 30 ml, Concⁿ H₂SO₄, Conc HNO₃
3. Distilled water
4. Test tubes, Beakers, funnel, boiling tubes, test tube stand, watch glass, filter paper etc.

II METHOD

About 50 gm. of P. emblica fruit was thoroughly washed in running water, carefully cut into small pieces and crushed well mechanically. The prepared amla extract was first filtered by filtration with the help of cotton and then using a Whatmann filter paper. The resultant P. emblica fruit extract was utilized as the biogenic source for the preparation of Carbon quantum dots.

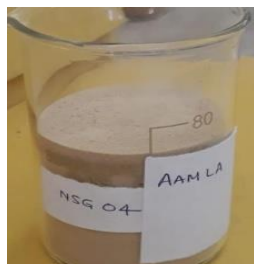
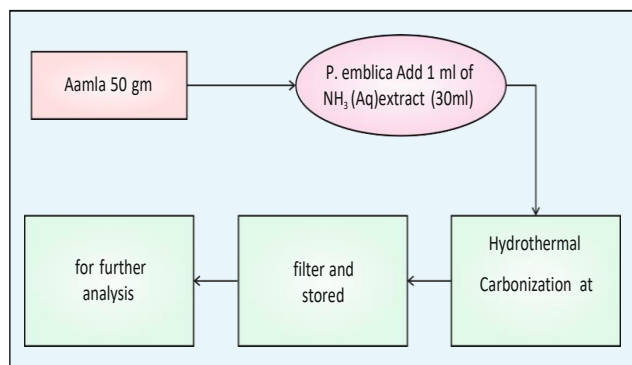


Figure-1 Phyllanthus Emblica (a) A herb (b) Powder

Figure 2: Extract of Phyllanthus Emblica

A simple one-pot hydrothermal Carbonization process was used for the preparation of CQDs from the P. emblica extract. In this process, the mixture of 30ml of the P. emblica extract and 1ml. of aqueous NH₃ was taken in a beaker. Add 1ml. H₂SO₄ for acidification of liquid NH₃. The solⁿ was kept in a hot air oven for 5 hrs. at 180^oC. After the completion of reaction the solution allowed to cool at room temp. (29^oC). Now the solution was filtered through a whatmann 40 filter paper and centrifuge for 15 min at 1000 rpm. The resultant dark brown solⁿ. Containing CQDs was collected and carefully stored in a cool place for further studies.



III RESULT & DISCUSSION

Optical Properties:-

When applied green hydrothermal method of Amla fruits has resulted in the colour transformation from pole green to blakish brown indicated the formation of carbon quantum dots. For analyzing the optical characters UV visible spectroscopy is the most valuable tech.

Surface Morphology:-

TEM image of the carbon quantum dots at the range in 20 nm. Carbon quantum dots spread on copper grid is synthesized by green method and spherical in nature .The dimeter of CQDs is 4.08 nm. And size from 1-10 nm.

Structural Analysis:-

The FTIR spectra of Amla fruit and green CQDs synthesized by p. Embilica extract shows broad bands at 3415, 2857, 1706, and 1342 cm⁻¹ that C-H C=O, And C-O-C functional groups respectively. The IR spectra of CQDs had absorption bands at 3536, 2838, 1529, and 146 cm⁻¹ and stretching frequency of -OH, NH -CH and C-N functional groups respectively.

Uv/vis Spectrum

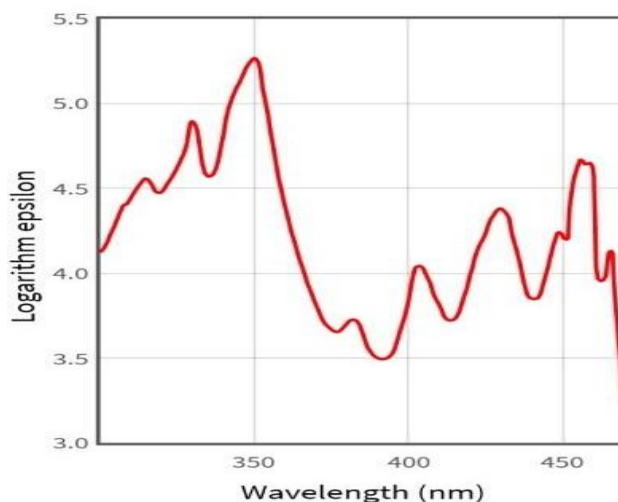


Figure-3: UV - Spectra of P- Emblica Carbon Quantum Dots

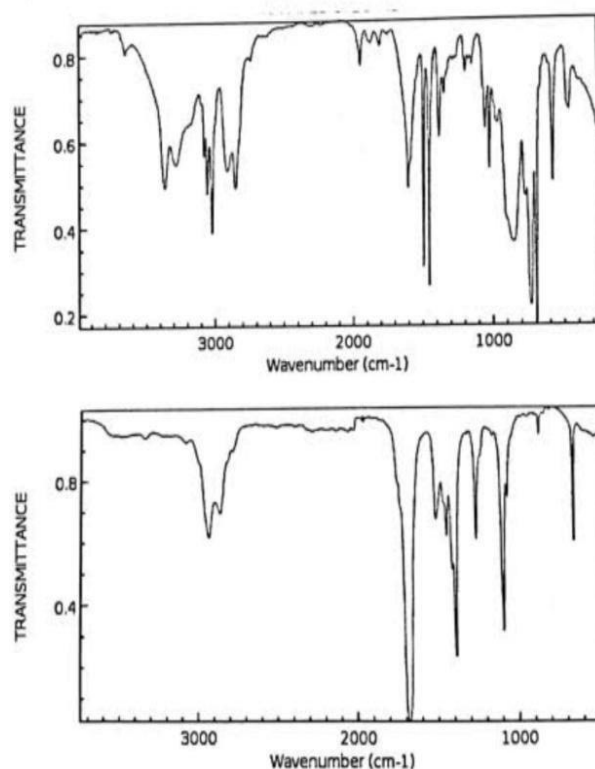


Figure- 4: IR - Spectra of P- Emblica Carbon Quantum Dots

Application of the synthesized CQDs:-

The green synthesized CQDs from gooseberry fruit have dispensability and can show high fluorescence quality and aqueous stability used in bio-imaging applications. So these green synthesized carbon quantum dots used as a fluorescent probe for live cell imaging .For the utilization of the real biological system the bio compatibility of a fluorescent probe is a significant factor in biomedical applications.

IV CONCLUSION

In summary, The green carbon quantum dots have been synthesized by surface functionalization using gooseberry fruit amla as a carbon source and aqueous ammonia as a solvent. This is hydrothermal one step clean and economic method. The green synthesized carbon quantum dots have nitrogen and oxygen atom. A high fluorescent activity is shown by the aqueous solution of synthesized CQDs which is depends upon the excitation wavelength and its high photostability.

In various optical applications CQDs are successfully employed as a tool because of their fluorescent emission properties excellent stability low cytotoxicity and good compatibility.

CQDs also used as a staining agent in bio-imaging applications bio-imaging of HTC-116 human colon cancer cell and also for bio-imaging for others.

For writing and drawing without any chemical modification CQDs were used as a fluorescent ink. And for CQD is also used as a ink for thumb impression as it glow when placed in under UV light and does not required any other treatment. CQD is also used as in wet treatment of fingerprint impression as a fluorescent ink.

Because this is eco-friendly and user friendly tech. compared to available conventional powder dusting method. Because of good permeability of green CQDs they are also used for bio-logical applications to the whole part of the cells including intended drug.

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