



PHOTOLUMINESCENT CARBON QUANTUM DOTS DERIVED FROM BIOCHAR VIA A GREEN HYDROTHERMAL METHOD

Patent No. PI 2016703467

NEED

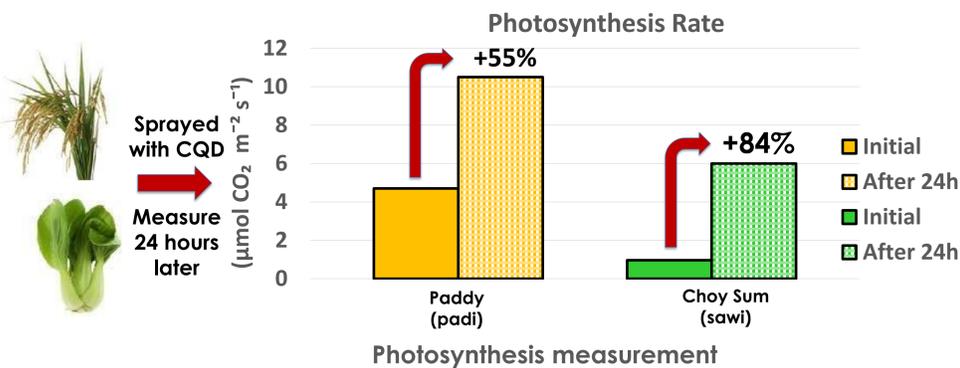
Carbon Quantum Dots (CQD) are nanosized fragments of carbon nanomaterials, with sizes typically less than 10 nm. They have high surface area and possess unique electrical and optical properties rendering them **photoluminescent**. The main problems that limits their applications are (i) their exorbitant price, (ii) their method of production which leaves toxic residue. Our innovation is that we have found a solution to address these problems. This has created several potential new customer markets for the use of CQD in sectors like energy storage and sensors. The most immediate new customer market we have created is in the agriculture sector, where CQD is used as a photosynthesis enhancer. This will have a huge impact on the future of food security in Malaysia and around the globe.

APPROACH

We have replaced the conventional top-down synthesis of CQD with a green, acid-free hydrothermal approach. The process is simple, fast and scalable, using sustainable and cheap raw materials. This makes our product 90% cheaper than the products on the market. The process is green and acid-free, which leaves no toxic residue on the material,

A technology which can offer more than 90% reduction in cost	Raw materials used are abundant and sustainable
Photoluminescent CQD	
The hydrothermal method is a green, acid free process and scalable technology	Safe to be applied in various applications due to nontoxic nature of carbon

Application of Carbon Quantum Dots as Photosynthesis Enhancer



Details	Price (RM) Per production of 1g biochar in 100 ml solvent	CQD (100 ml)	Price (RM)	
			5 mg/ml	1 mg/ml
Biochar	0.01	ACS Material	930 (USD 220)	930 (USD 220)
Co-Solvent	40	UPM	95	19
Reactor	30			
Equipment Rental	25			
TOTAL	95			

More than 90% cheaper

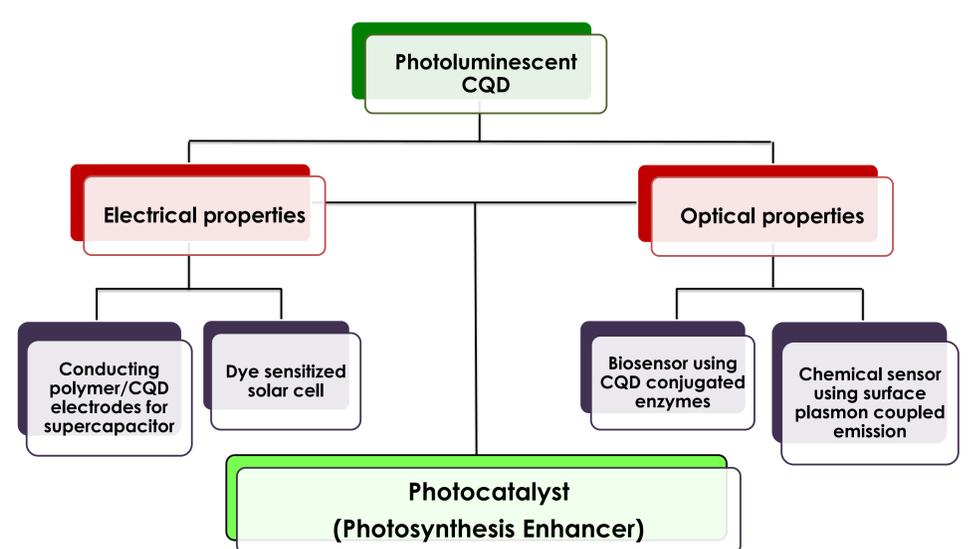
Photoluminescence Properties of CQD Derived From Different Types of Biochar

Fig. 1 Carbon quantum dots under UV-lamp 365nm. From left to right; coconut shells, kenaf and empty fruit bunch

Fig. 2 FTIR spectra of biochar (a) coconut shell, (b) empty fruit bunch and (c) kenaf

Fig. 3 PL spectra of three different types of biochar based carbon quantum dots at excitation wavelength of 325nm

Fig. 4 Coconut shell, Kenaf, and Empty fruit bunch based CQD (from left to right)



INDUSTRIAL LINKAGES



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