



Anand Nagar, Krishnankoil - 626126, Srivilliputtur (via), Virudhunagar District, Tamilnadu.

## APPLICATION FOR ADMISSION TO Ph.D. PROGRAMMES

Date of Application:28-05-2020

Department	PHYSICS	Application No.	20200030
Area of Research	NANOTECHNOLOGY	Research Mode	FULL TIME

Name :S JACOB ROSARIAN JOY

Date of Birth / Age :15-10-1996 / 23 Years

Gender :MALE

Category :BC

e-Mail ID :joyxavier15@gmail.com

Mobile :8608395740



*S Jacob Rosarian Joy*

Father's/Husband's Name	S SAVARIMUTHU	Father's/Husband's Occupation	EX-ARMY
Family Income	200000	Residential Type	RURAL
Birth Place	PALAYAMKOTTAI	Mother Tongue	TAMIL
Religion	CHRISTIAN	Martial Status	SINGLE
Aadhaar No.	978122341724	PAN No.	BKQPJ8296
Physically Challenged	NO	Type of Disability	-
Address for Communication: 75/6A/29 RAJAGANAPATHI NAGER METTUR SALEM DISTRICT TAMIL NADU INDIA Pin-636401		Permenant Address: 75/6A/29 RAJAGANAPATHI NAGER METTUR SALEM DISTRICT TAMIL NADU INDIA Pin-636401	

Qualification						
Degree	Discipline	College/university	Year Passed	AVG/CGPA	Class	Mode
MSC	PHYSICS	KARUNYA INSTITUTE OF SCIENCE & TECHNOLOGY	2019	7.10	FIRST CLASS	REGULAR
BSC	PHYSICS	LOYOLA COLLEGE	2017	5.11	SECOND CLASS	REGULAR

Experience				
Organization	Designation	Experience From	Experience TO	Work Nature

Payment Details				
Transaction ID	Reference	Date of transaction	Amount	Status
20200030_200625184719	SHMP8932153471	25-06-2020	600	SUCCESS

**NANOMATERIALS FOR BIO APPLICATION**  
**PhD Research Proposal**

Submitted by  
**JACOB ROSARIAN JOY.S**

Application Number  
**20200030**

Centre for Research

July 2020

## ABSTRACT

Nanotechnology has attracted a great deal of attention in the last few years as miniaturization and Nano materials are often foreseen to be the key for a sustainable future. In a broad sense, Nano Science and nanotechnology makes use of the tools of synthetic and materials chemistry to generate Nanomaterials with size, shape and surface properties that can be designed to evoke a specific function with aim to be utilized in various potential applications. Nanotechnology allows us to manipulate the matter on a molecular scale (much less than 100 nm), helping us to obtain valuable information for the synthesis of new materials with specific properties and with a high degree of reproducibility. The proposed work mainly focuses on the green synthesis of carbon quantum dots using hydro thermal method. The nanomaterials will be characterised to study the structural and optical properties. The prepared nanomaterial will be used for bio medicine in Vivo and in Vitro bio-imaging, drug delivery.

## INTRODUCTION

Carbon based quantum dots consisting of graphene dots(QGDS) and carbon quantum dots (CQDS, C – dots or CDs). or a new class of carbon nanomaterial with sizes below 10nm. They are first obtained during the purification of single walled carbon nanotubes through preparative electrophoresis in 2004. Carbon is commonly a black material and was generally considered to have a low solubility in water and weak fluorescence. Carbon based quantum dots have good solubility and strong luminescence. So they are referred as carbon nanolights. They are the best alternative to the semiconductor quantum dots.

## PROPERTIES OF CARBON QUANTUM DOTS:

High stability, good conductivity, low toxicity and environmental friendly, CQDs have been extensively investigated especially due to their strong and tuneable fluorescence emission properties. Many carboxyl moieties on the CQDs surface impart excellent solubility in water, CQDs are suitable for chemical modification and surface passivation with various organic, polymeric, inorganic (or) biological materials. CQDs have crystalline or amorphous structure, quasi spherical discrete carbon nanoparticle. The study of photoluminescence of such carbon dots at different temperatures which helps to understand the luminescent mechanism of carbon dots.

## SYNTHESIS, SIZE CONTROL, MODIFICATION:

Many methods have been proposed to prepare CQDs during the last decade which can be roughly classified into "Top down" and "bottom up" and they can be modified during preparation or post treatment. Three problems facing CQDs preparation (1) carbonaceous aggregation during carbonization which can be avoided by using electrochemical synthesis, confined pyrolysis or solution chemistry methods. (2) Size

control and uniformity which is important for uniform properties and can be optimised via post treatment such as gel electrophoresis, centrifugation and dialysis. (3) Surface properties that are critical for solubility and selected applications which can be tuned during preparation or post treatment. Surface modification is a powerful method to tune surface properties. There are many approaches for functionalising the surface of CQDs through the surface chemistry or interaction, such as covalent bonding, coordination,  $\pi$  - $\pi$  interaction and sol-gel technology. The majority of CQDs are rich in Oxygen containing groups, which endows them with feasibility in covalent bonding. Surface passivation via covalent bonding of amine containing agents is a common method to improve the PL of CQDs.

## SCOPE OF STUDY:

Carbon quantum dots are used in many applications such as in bio medicine, bio sensor, bio drug delivery. In optronics such as dye sensitized solar cells, organic solar cells, super capacitors and light emitting diodes. Carbon quantum dots in biological labelling and in bio imaging have more potential application. CQDs can show a PL emission in the near infra-red (NIR)spectral region. Under NIR light excitation.

## LIMITATION OF STUDY:

The CQDs have great potential in many applications but there are still some difficulties in the assembly of efficient and high quality and poor control over sizes.

## REVIEW OF LITERATURE SURVEY:

**Bui Thi Hoan.** Et. Al (2019) in this article Green synthesis of highly luminescent quantum dots obtain from lemon juice by hydro thermal method. The ivory white solution of lemon juice was changed to dark brown solution indicated the formation of C dots. These solutions emitted green colour under ultra violet excitation. They demonstrated that the strong and stable green light emission of C- dots could be

synthesised successfully by one-part hydrothermal method. The PL intensity of C dots increase with increasing hydrothermal temperature and time. IN addition, C - dots diluted by polar solvents induced strong luminescence than did the pure C-Dots. The obtains carbon dots having strong, inert and stable luminescent properties would be particularly important for potential application in Optoelectronics and Bio engineering.

**A.N.Kapitonov** et al in this article the synthesised carbon dots from glucose,soot,juices of berries and citric acid. The photo luminescence of obtained carbon dots are investigated. All the samples exhibit excitation dependant emission. The photo luminescence intensity peaks are red shifted by approximately 70nm, with an excitation wavelength of 300 – 400 nm. CDs composite material changes the LED optical properties.

**Nagamalai Vasimalai** et al (2018) this article Green Synthesis of fluorescent carbon dots from spices such as cinnamon, red chillies, black pepper and turmeric. The C – dots synthesised using spices as starting material through a green one-pot hydro thermal method that involves pyrolysis, carbonization and passivation with no need to add surface passivation agents or any additives. The obtained carbon dots are characterised by UV- vis spectrometer and fluorescent spectroscopy. UV – vis spectra of each type of spice derived C- Dots reveal two absorption bands. Cinnamon C – Dots show characteristic absorption bands at 275 and 324 nm, red chilli C- Dots at 273 and 315 nm, Turmeric C-Dots at 282 and 329 nm, and black pepper C – Dots at 279 and 329 nm.

**YouFu Wang** et al (2014) this article carbon dots are synthesised from several methods chemical ablation, electro chemical carbonisation, Laser ablation, Microwave irradiation, Hydro thermal treatment. The CQDs were prepared via HTC from many precursors such as banana juice, glucose, citric acid and chitosan. The synthesised material were low toxicity but poor control over the sizes. In laser ablation, where the surface states are tunable but low quantum yield and poor control oversize. In electro chemical carbonization size and Nano structure are controllable and stable.

**Pooria Namdari** et al (2016) in this article the carbon quantum dots are synthesised by several methods, Chemical ablation, Electro chemical carbonisation, Laser

ablation, Microwave irradiation, Hydrothermal treatment and Optical properties were studied. In chemical ablation the quantum yield is 4.34 %. In Electro chemical carbonisation the quantum yield is 25.6 %. the size and Nano structure are controllable and stable. In Laser ablation low quantum yield and poor control over sizes. In microwave irradiation greenish yellow luminescent GQDs were obtained with the diameter of 4.5nm. The quantum yield is high 11.7 % to 22.9 %. This method is fast and scalable inexpensive. In Hydrothermal method the prepared dot possessed strong fluorescence with PL quantum yield as high as 11.4% and could be dissolved in water and most polar organic solvents without further chemical modification. The Nano size ranges from 5 – 13nm

## METHODOLOGY:

### **Hydrothermal Technique**

Hydrothermal synthesis is the one of the simplest, economical and widely synthetic routes used to prepare CDs. This method has the advantages of cheap instrumentation, low energy consumption. Many research groups have also developed hydro thermal synthesis using green precursors such as beverage, fruit extract, food products and bio mass. By optimising the ratio of precursors, temperature and reaction time, CDs with homogenous size distribution and good florescence properties for obtain. The hydrothermal synthesis of CDs was carried out using Teflon lined autoclave. Mohapatra et al synthesised high photo luminescent CQDs with quantum yield of 26% in one step by HTC of Orange juice. Then they centrifuged resultant mixture. These carbon dots with sizes of 1.5 – 4.5 nm where used in bio imaging due to their low toxicity and high photo stability. A.N. KAPITONOV et al synthesised carbon Qdots from glucose, soot, juices of berries and citric acid using HTC. All the sample exhibit excitation-dependant emission. The photo luminescence intensity peaks are redshifted by 70nm, with an excitation wavelength of 300 – 400nm. These CDs composite material change the LEDs optical properties. Bui Thi Hoan et al synthesised high luminescent carbon quantum dots from lemon juice. They have high PL intensity used in Optoelectronics and bio

imaging.

#### REFERENCE:

Pooria Namdari, Babak Negahdari (2016) Synthesis, properties and bio medical application of carbon based quantum Dots.

YouFu Wang and Aiguo Hu (2014) carbon quantum dots: synthesis properties and application

A.N.Kapitonov, M.N.Egorova, Hydrothermal Synthesis of Carbon Dots and Their Luminescence.

Nagamalai Vasimalai, Vania Vilas – Boas (2017) Green Synthesis of fluorescent carbon dots from spices for in vitro imaging and tumour cell growth inhibition.

Kok Ken Chan, Stephanie Hui Kit Yap (2018) Bio green Synthesis of Carbon dots for Biotechnology and Nano medicine Application.

Bui Thi Hoan, Phuong Dinh Tam (2018) Green Synthesis of Highly Luminescent Carbon Quantum Dots from Lemon Juice

#### TIMELINE OF THE RESEARCH

Work Plan	Time
Literature review	3 months
Material selection	3 months
Optimization	6 months
Synthesis of CQDs	1 year
Characterization	6 months
Results and discussion	6 months

Sl. No. : F 005008

# Karunya INSTITUTE OF TECHNOLOGY AND SCIENCES

(Declared as Deemed to be University under Sec. 3 of the UGC Act, 1956)

A CHRISTIAN MINORITY RESIDENTIAL INSTITUTION

NAAC Accredited, AICTE & MHRD Approved

KARUNYA NAGAR, COIMBATORE - 641 114, TAMIL NADU, INDIA.

Reg. No. : PRK17PH1008

Mode of Study : Regular



*The Board of Management  
of  
Karunya Institute of Technology and Sciences,  
a Deemed-to-be-University  
hereby makes known that*

**JACOB ROSARIAN JOY S**

*has been admitted to the Degree of  
Master of Science  
in  
Physics*

**under the Faculty of Science**

*having been certified by duly appointed examiners to be  
qualified to receive the same and was placed in the*

**FIRST CLASS**

*at the examination held in MAY 2019*

*Given under the seal of the Deemed-to-be-University*

*Dated: 6<sup>th</sup> July 2019*



*Paul Thirakaraud*  
CHANCELLOR

*[Signature]*  
VICE CHANCELLOR

*[Signature]*  
REGISTRAR



# Karunya INSTITUTE OF TECHNOLOGY AND SCIENCES

(Declared as Deemed to be University under Sec. 3 of the UGC Act, 1956)

A CHRISTIAN MINORITY RESIDENTIAL INSTITUTION

NAAC Accredited, AICTE & MHRD Approved

KARUNYA NAGAR, COIMBATORE - 641 114, TAMIL NADU, INDIA.

## CONSOLIDATED STATEMENT OF GRADES

NAME : JACOB ROSARIAN JOY S  
COURSE : M.Sc.  
BRANCH : Physics

SI. No. : F 004660  
FOLIO No. : 103  
REGISTER No. : PRK17PH1008  
MONTH & YEAR OF ADMISSION : JULY 2017

SEM	SUBJECT CODE	NAME OF THE SUBJECT	SUBJECT CREDIT	LETTER GRADE	MONTH & YEAR OF PASSING	SEM	SUBJECT CODE	NAME OF THE SUBJECT	SUBJECT CREDIT	LETTER GRADE	MONTH & YEAR OF PASSING
1	17PH3001	Classical Mechanics	3.0.0	C	DEC 2017						
1	17PH3002	Statistical Mechanics and Thermodynamics	3.0.0	C	DEC 2017						
1	17PH3003	Mathematical Physics I	3.1.0	B	DEC 2017						
1	17PH3004	Semiconductor Physics	3.0.0	B	DEC 2017						
1	17PH3006	Physical Optics	3.0.0	B	DEC 2017						
1	17PH3016	Thin Film Technology	3.0.0	C	DEC 2017						
1	17PH3025	General Physics Lab-I	0.0.2	B	DEC 2017						
1	17PH3027	Advanced Physics Lab-I	0.0.4	O	DEC 2017						
2	17PH3005	Quantum Mechanics-I	3.0.0	P	MAY 2019						
2	17PH3007	Mathematical Physics-II	3.1.0	P	MAY 2018						
2	17PH3008	Atomic and Molecular Spectroscopy	3.0.0	C	DEC 2018						
2	17PH3009	Electromagnetic Theory	3.0.0	P	MAY 2018						
2	17PH3014	Physics of Nanomaterials	3.0.0	A	MAY 2018						
2	17PH3026	General Physics Lab-II	0.0.2	A	MAY 2018						
2	17PH3028	Advanced Physics Lab-II	0.0.4	S	MAY 2018						
2	17VE3002	Value Education	0.0.2	B	MAY 2018						
3	17NT3002	Nanoelectronics	3.0.0	B	DEC 2018						
3	17PH3010	Quantum Mechanics-II	3.0.0	P	MAY 2019						
3	17PH3011	Nuclear and Particle Physics	3.0.0	P	DEC 2018						
3	17PH3012	Spectroscopy	3.0.0	B	DEC 2018						
3	17PH3013	Solid State Physics	3.0.0	B	MAY 2019						
3	17PH3017	Renewable energy sources	3.0.0	B	DEC 2018						
3	17NT3044	Advanced Material characterization Lab	0.0.2	S	DEC 2018						
3	17PH3030	Computational Physics lab	0.0.2	S	DEC 2018						
4	FSP3999	Full Semester Project	0.0.20	A	MAY 2019						
Non-Academic Programs (Not considered for CGPA Calculation)											
2	NA382	Astronomy Club	0.0.1	O	MAY 2018						
*** End of Statement ***											

ACADEMIC CREDITS		NON-ACADEMIC CREDITS		CUMULATIVE GRADE POINT AVERAGE(CGPA)	CLASS AWARDED
REQUIRED	EARNED	REQUIRED	EARNED		
90	91	1	1	7.10	FIRST CLASS



Date: 29-06-2019



To get percentage of marks, multiply the CGPA by 10

For details turn overleaf

CONTROLLER OF EXAMINATIONS



**Karunya INSTITUTE OF TECHNOLOGY AND SCIENCES**

(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)

A CHRISTIAN MINORITY RESIDENTIAL INSTITUTION

AICTE Approved & NAAC Accredited

Karunya Nagar, Coimbatore - 641 114, Tamil Nadu, India.

Phone : +91-422-261 4300

Fax : +91-422-261 5615

Website : www.karunya.edu

E-mail : ku@karunya.edu

## TRANSFER CUM CONDUCT CERTIFICATE

Date : 20/06/2019

Serial No. **25795**

1. Name of the Student : **JACOB ROSARIAN JOY S**
2. Gender : Male
3. Date of Birth (in words) : 15/10/1996  
(Fifteenth October Nineteen Ninety Six)
4. Nationality : Indian
5. Religion, Community & Caste : Refer Community Certificate issued by Revenue Authorities
6. Course Details
  - a. Date of Admission : 29/07/2017
  - b. Register Number : PRK17PH1008
  - c. Course : Master of Science
  - d. Branch / Specialization : Physics
  - e. Academic Period : 2017 - 2019
7. Medium of Instruction : English
8. Semester in which the student was studying / completed at the time of leaving : IV Semester
9. Whether qualified for promotion to a higher class : Refer Mark Statement
10. Whether the student has paid all the fees due to the institution : Yes
11. Whether the student was in receipt of any scholarship through the institution (nature of the scholarship to be specified) : No
12. Date on which the student left : May 2019
13. Conduct of the Student : Good
14. Remarks, if any : --

Signature of the Registrar with Seal

Registrar,  
Karunya Institute of Technology and Sciences  
(Deemed to be University)  
Karunya Nagar,  
Coimbatore-641114

## JACOB ROSARIAN JOY S

75/6A/29 Raja ganapathi nager, Mettur dam-1, Salem district, pin code-636401  
8608395740 | Joyxavier15@gmail.com



### EDUCATION

---

- **Karunya institute of technology and science Coimbatore**  
Msc (physics)  
7.11  
2019
- **Loyola college Chennai**  
Bsc(physics)  
5.11  
2017

### TECHNICAL SKILLS

---

- Knowledge of handling sputtering unit and vacuum coating unit(thermal evaporation method)

### PROJECTS

---

- **Pentacene based field effect transistor** *5 month's*  
Using thermal evaporation method the pentacene based fet is made where pentacene is used as a channel

### INDUSTRIAL EXPOSURE

---

- Spring's India, Chennai(1month)

### INTERESTS

---

- Fabrication of thin film devices
- Fabrication of nanomaterials

### PERSONAL PROFILE

---

- Date of Birth : 15/10/1996
- Marital Status : Single
- Nationality : Indian
- Known Languages : English and Tamil

### DECLARATION

---

I hereby declare that all the information mentioned above is correct up to my knowledge and bear the responsibility for the correctness of the mentioned particular.

आयकर विभागा

भारत सरकार

INCOME TAX DEPARTMENT



GOVT. OF INDIA



स्थायी लेखा संख्या कार्ड

Permanent Account Number Card

BKQPJ8296J

नाम / Name

JACOB ROSARIAN JOY S

पिता का नाम / Father's Name

SAVARIMUTHU

जन्म की तारीख / Date of Birth

15/10/1996

*A. Jacob Rosarian Joy S*

हस्ताक्षर / Signature





# India Driving Licence(Tamilnadu)

Form 7

DOI 14/09/2016

சாவாரி அபர

D.L.No : TN52Z20160002624

Name : JACOB ROSARIAN JOY S

S/D/W of : SAVARIMUTHU S

Address :

75/6A-29, RAJAGANAPATHY NAGAR  
METTUR TK, SALEM DT  
636401

Temp. Addr:

FRIENDS DRIVING SCHOOL

D.O.B : 15/10/1996 B.G. :

Punishments:



Licensed to drive throughout India, vehicles of the following descriptions  
M/CYCL. WG 14/09/2016 TNS2Z LMV-NT 14/09/2016 TNS2Z

Non-Transport Veh. Valid upto 13/09/2036



A. Sankaranarayanan

Signature/L.T.I  
of the Holder

P. Sankaranarayanan

Asst. Licensing Authority  
UO, METTUR

உ. ராணி: 695/11 (ஆ) 2. 8.11

R.Dis...../20

GCP-374-7-13,35,000 Cps.-09-02-2010 [Hcl-4]

Dated.....20

BC



சான்றிதழ் எண் :  
Certificate No. :

9887031

மாவட்டக் குறியீடு எண் :

District Code

06

வட்டக் குறியீடு எண் :

Taluk Code

04

கிராமக் குறியீடு எண் :

Village Code

011

### வகுப்புச் சான்றிதழ் COMMUNITY CERTIFICATE

இவ்வூர்.....மாவட்டம்.....வட்டம்  
கிராமம்/நகரம், திரு/திருமதி/செல்வன்/செல்வி  
ஜேகீதீப் ராசாரியன் ஜாய் தம்பனார்/தனவர் பெயர்.  
சுவரிமந்தி / சிவசீவ - வெள்ளாள் கிராமம் சார்ந்தவர்  
அரசு ஆணை நிலை எண்-28, பிற்பட்ட மற்றும் மிகவும் பிற்பட்ட பிரிவின  
நலத் துறை, நாள் 19-7-1994 வரிசை எண்.....படி பிற்பட்ட பிரிவினைச்  
சார்ந்தவர் எனச் சான்றளிக்கப்படுகிறது.

This is to certify that..... Son / Daughter of  
Thiru..... of.....  
Village / Town..... Taluk.....  
District of the State of Tamil Nadu belongs to.....  
Community, which is recognised as a  
Backward Class as per Government Order (Ms.) No. 28, Backward Classes  
and Most Backward Classes Welfare, dated 19th July 1994  
vide Serial No.....

2. திரு / திருமதி / செல்வன் / செல்வி ஜேகீதீப் ராசாரியன் ஜாய்  
என்பவரும் அவருடைய குடும்பத்தினரும் தமிழ்நாட்டில்  
மாவட்டத்தில்..... வட்டத்தில்.....  
கிராமத்தில் / நகரத்தில் வசித்து வருகிறார்கள் எனச் சான்றளிக்கப்படுகிறது.

2. It is certified that Thiru/Tmt./Selvan/Selvi..... and  
his/her family ordinarily reside(s) at ..... Village/Town  
..... Taluk ..... District of  
Tamil Nadu.

முத்திரை  
Seal.



கை.....  
Signature :  
METTUR

நாள் :  
Date :

பெயர் (தனி எழுத்துக்களில்)  
Name (in Capital Letters) :

பதவி :  
Designation :

26.8.11