ASHUTOSH SAHU

CONTACT

Bhubaneswar, India 759128

Mobile: 9861852353

sahuashutosh524@gmail.com

EDUCATION

- **Integrated M.Sc : Chemistry (5 Years)**
  Aug 2015 – June 2020
  National Institute of Technology, Rourkela, Odisha, India
- **CGPA of B.Sc. (1st to 6th Semester) : 7.81**
- **CGPA of M.Sc. (7th to 10th Semester) : 8.04**

- **Higher Secondary Education**
  Aug 2011- May 2013
  Rajdhani Junior College, Bermunda, Bhubaneswar, Odisha, India
- Relevant Course work Completed : Physics, Chemistry, Mathematics & Biology.
- **Percentage : 74.00%**

- **Secondary Education:-**
  March 2011
  Colliery High School
  Dera, Talcher, Angul, Odisha, India
- General Science
- **Percentage : 90.83%**

LANGUAGES:-
Fluent Speaker
- **English**
- **Hindi**
- **Odia (Native)**

PROFESIONAL SUMMARY

Looking forward for a challenging position where I can effectively utilities my expertise, knowledge and skills by providing exceptional supervision and positive intent and where there are opportunity for advancement especially in the field of Nano-Science Research and development.

ACCOMPLISHMENTS

- Basic Knowledge in C, C++, MATLAB, Origin.
- Basic knowledge in X-Ray diffraction, DLS (Dynamic Light Scattering), UV-Visible Spectroscopy, Fluromax-4 Spectrophotometer, TEM (Transmission Electron Spectroscopy, NMR, IR, Mass Spectroscopy.

SKILLS

- Online Content Delivery
- Student Counselling
- Power point Presentation

WORK HISTORY

- **December 2019 - June 2020**
  Research Scholar, Nano-Material Chemistry, NIT Rourkela, India
  Novel Synthesis of g-C_3N_4 / TiO_2 Nanocomposite from Urea and Titanium Oxysulfate
  Techniques - X-Ray diffraction, DLS (Dynamic Light Scattering), UV-Visible Spectroscopy, Fluromax-4 Spectrophotometer.
- **Supervisor – Dr. Aparna Mondal**
  National Institute of Technology, Rourkela, Odisha, India
- **August 2019- December 2019**
  Product development laboratory -1
  Characterisation of Gold Nano-particles
  Techniques -DLS (Dynamic Light Scattering), UV-Visible Spectroscopy, TEM (Transmission Electron Spectroscopy
- **Supervisor – Dr. R.K Behera**
  National Institute of Technology, Rourkela, Odisha, India
- **May 2018 – August 2018**
  Summer Research Intern IIT,Guwahati, India
  Preparation of 3-Aryl Quinolines through Tandem Cyclisation by using Alpha amino Acetophenone and trans beta nitro styrene.
- Techniques - NMR, IR, Mass Spectroscopy.
- **Supervisor – Dr. A.T Khan**
  Indian Institute of Technology, Guwahati, Assam, India

NATIONAL INSTITUTE OF TECHNOLOGY ROURKELA

GRADE CARD

MASTER OF SCIENCE (5 YEAR INTEGRATED PROGRAMME)

Name :	ASHUTOSH SAHU	Department :	CHEMISTRY
Roll No. :	415CY5017	Joined :	AY 2015-16 Graduated : AY 2019-20

BACHELOR OF SCIENCE (3 Years)
[Part-I of 5 Year Integrated M.Sc. Programme]

1st Semester

Subject Code	Subject Name	L-T-P	Credits	Grade
CE100	Engineering Mechanics	3-1-0	4	P
CY101	Chemistry	3-1-0	4	C
EE100	Basic Electrical Engineering	3-1-0	4	P
MA101	Mathematics - I	3-1-0	4	P
PH101	Physics - I	3-1-0	4	D
CE171	Engineering Drawing	0-0-3	2	A
CS171	Computing Laboratory - I	0-0-3	2	B
PH170	Physics Laboratory	0-0-3	2	A
WS171	Workshop Practice I	0-0-3	2	A
EA173	NSS-I	0-0-3	2	C

Semester Credits :	30	Semester Grade Point Average (SGPA):	6.53
Total Credits :	30	Cumulative Grade Point Average (CGPA):	6.53

2nd Semester

Subject Code	Subject Name	L-T-P	Credits	Grade
CE130	Environment and Safety Engineering	3-1-0	4	A
CS102	Data Structures and Algorithms	3-1-0	4	B
EC100	Basic Electronics Engineering	3-1-0	4	D
LS100	Biology	3-1-0	4	C
MA102	Mathematics – II	3-1-0	4	D
CS172	Computing Laboratory – II	0-0-3	2	A
CY170	Chemistry Laboratory	0-0-3	2	A
ME170	Machine Drawing and Solid Modeling	0-0-3	2	A
WS172	workshop Practice – II	0-0-3	2	A
EA176	Physical Education-II	0-0-3	2	EX

Semester Credits :	30	Semester Grade Point Average (SGPA):	7.87
Total Credits :	60	Cumulative Grade Point Average (CGPA):	7.20

3rd Semester

Subject Code	Subject Name	L-T-P	Credits	Grade
CH213	Chemical Engineering Thermodynamics	3-1-0	4	C
CY211	Basic Organic Chemistry-I	3-1-0	4	A
CY231	Basic Physical Chemistry-I	3-1-0	4	A
CH215	Basic Chemical Engineering	3-0-0	3	B
MA205	Introduction to Numerical Analysis	3-0-0	3	P
CH271	Process Technology Laboratory	0-0-3	2	A
CY271	Basic Organic Chemistry Laboratory	0-0-3	2	A
MA270	Numerical Methods Laboratory	0-0-3	2	A
PH271	Waves and Optics Laboratory	0-0-3	2	C

Semester Credits :	26	Semester Grade Point Average (SGPA):	7.96
Total Credits :	86	Cumulative Grade Point Average (CGPA):	7.43

4th Semester

Subject Code	Subject Name	L-T-P	Credits	Grade
CY212	Basic Organic Chemistry - II	3-1-0	4	B
CY221	Basic Inorganic Chemistry - I	3-1-0	4	A
CR348	Ceramics in Electronic Applications	3-0-0	3	A
MA204	Introduction to Complex Analysis	3-0-0	3	P
PH206	Introduction to Classical Mechanics	3-0-0	3	C
CY272	Basic Physical Chemistry Laboratory	0-0-3	2	A
CY273	Chemical Biology Laboratory	0-0-3	2	A
HS270	Language Laboratory	0-0-3	2	A
PH272	Electricity and Magnetism Laboratory	0-0-3	2	B

Semester Credits :	25	Semester Grade Point Average (SGPA):	8.04
Total Credits :	111	Cumulative Grade Point Average (CGPA):	7.57

5th Semester

Subject Code	Subject Name	L-T-P	Credits	Grade
CY311	Chemistry of Industrial Materials	3-1-0	4	A
CY331	Basic Physical Chemistry – II	3-1-0	4	B
CH226	Treatment of Industrial Effluent	3-0-0	3	A
LS201	Basic Biochemistry	3-0-0	3	C
MA301	Algebra	3-0-0	3	P
CY371	Basic Inorganic Chemistry Laboratory	0-0-3	2	A
LS271	Basic Biochemistry laboratory	0-0-3	2	B
MA371	Laboratory Work on Mathematical Software	0-0-3	2	B
PH371	Properties of Matter Laboratory	0-0-3	2	B

Semester Credits :	25	Semester Grade Point Average (SGPA):	7.88
Total Credits :	136	Cumulative Grade Point Average (CGPA):	7.63

6th Semester

Subject Code	Subject Name	L-T-P	Credits	Grade
CY312	Chemistry of Natural Products	3-1-0	4	EX
CY321	Basic Inorganic Chemistry – II	3-1-0	4	EX
FP210	Food Chemistry	3-1-0	4	A
CR218	Introduction to Ceramics	3-0-0	3	A
PH204	Introduction to Condensed Matter Physics	3-0-0	3	D
CY372	Quantitative Analysis of Inorganic/Organic Compounds Laboratory	0-0-3	2	A
LS372	Bioinstrumentation Laboratory	0-0-3	2	B
MA372	Statistics Laboratory using different Software	0-0-3	2	B
PH372	Thermal Laboratory	0-0-3	2	A

Semester Credits :	26	Semester Grade Point Average (SGPA):	8.81
Total Credits :	162	Cumulative Grade Point Average (CGPA):	7.81

Name :	ASHUTOSH SAHU	Department :	CHEMISTRY
Roll No. :	415CY5017	Joined :	AY 2015-16 Graduated : AY 2019-20

MASTER OF SCIENCE (2 Years)
[Part-II of 5 Year Integrated M.Sc. Programme]

7th Semester

Subject Code	Subject Name	L-T-P	Credits	Grade
CY411	Stereochemistry and Reaction Mechanism	3-1-0	4	A
CY421	Main Group and Transition Metal Chemistry	3-1-0	4	B
CY431	Quantum Chemistry	3-1-0	4	C
CY433	Chemical Kinetics and Photochemistry	3-1-0	4	C
PH332	Physics of the Universe	3-0-0	3	C
CY471	Organic Chemistry Laboratory – I	0-0-3	2	A
CY473	Inorganic Chemistry Laboratory – I	0-0-3	2	A
CY475	Physical Chemistry Laboratory – I	0-0-3	2	B
CY477	Product Development Laboratory - I	0-0-3	2	A

Semester Credits :	27	Semester Grade Point Average (SGPA):	7.96
Total Credits :	189	Cumulative Grade Point Average (CGPA):	7.84

8th Semester

Subject Code	Subject Name	L-T-P	Credits	Grade
CY412	Concerted and Non-concerted Reactions	3-1-0	4	C
CY422	Advanced Inorganic Chemistry	3-1-0	4	D
CY432	Chemical Applications of Group Theory	3-1-0	4	C
CY434	Environmental Chemistry	3-1-0	4	C
PH3062	Vacuum Science and Applications	3-0-0	3	B
CY472	Organic Chemistry Laboratory – II	0-0-3	2	A
CY474	Inorganic Chemistry Laboratory – II	0-0-3	2	EX
CY476	Analytical Chemistry Laboratory	0-0-3	2	A
CY478	Product development Laboratory - II	0-0-3	2	B

Semester Credits :	27	Semester Grade Point Average (SGPA):	7.56
Total Credits :	216	Cumulative Grade Point Average (CGPA):	7.80

9th Semester

Subject Code	Subject Name	L-T-P	Credits	Grade
CY511	Methods in Organic Synthesis	3-1-0	4	B
CY513	Spectroscopic Methods of Analysis	3-1-0	4	B
CY521	Bio-inorganic Chemistry	3-1-0	4	C
MM448	Advanced Engineering Materials	3-0-0	3	D
CY571	Computational Chemistry Laboratory – I	0-0-3	2	B
CY573	Physical Chemistry Laboratory – II	0-0-3	2	A
CY575	Material Synthesis Laboratory	0-0-3	2	B
CY593	Seminar and Technical Writing – I	0-0-0	2	A
CY591	Research Project – I	0-0-0	4	A
CY595	Short term Industrial/ Research Experience (SIRE)	0-0-0	2	A

Semester Credits :	29	Semester Grade Point Average (SGPA):	8.00
Total Credits :	245	Cumulative Grade Point Average (CGPA):	7.82

10th Semester

Subject Code	Subject Name	L-T-P	Credits	Grade
CY512	Structure and Function of Biomolecules	3-1-0	4	EX
CY5205	Solid State Chemistry	3-0-0	3	B
CY522	Organometallic Chemistry	3-0-0	3	B
LS308	Applied Biology	3-0-0	3	A
CY572	Computational Chemistry Laboratory – II	0-0-3	2	B
CY574	Environmental Chemistry Laboratory	0-0-3	2	EX
CY576	Environmental Monitoring Laboratory	0-0-3	2	A
CY594	Seminar and Technical Writing – II	0-0-0	2	B
CY592	Research Project – II	0-0-0	4	B
CY596	Comprehensive Viva-Voce	0-0-0	2	B

Semester Credits :	27	Semester Grade Point Average (SGPA):	8.63
Total Credits :	272	Cumulative Grade Point Average (CGPA):	7.90

CGPA of B.Sc. (1st - 6th Semester) : 7.81

CGPA of M.Sc. (7th - 10th Semester) : 8.04

Overall CGPA of Integrated M.Sc. (1st - 10th Semester) : 7.90

REMARKS :	Performance	Grade	Grade Point	Performance	Grade	Grade Point	Performance	Grade	Grade Point
	Excellent	Ex	10	Fair	C	7	Fail	F	2
	Very Good	A	9	Average	D	6	Incomplete Assesment	I	-
	Good	B	8	Pass	P	5	Debarred	X	-
				Satisfactory	S	-	Unsatisfactory	U	-

Date : 29 Jun 2020

COMPARED BY

ASSISTANT REGISTRAR (ACADEMIC)

Assistant Registrar
(Academic)
National Institute of Technology
Rourkela-769008, Odisha

18/0808/415CY5017

National Institute of Technology Rourkela

Upon the recommendation of the Senate,
hereby confers the degree of

Bachelor of Science (Honours)

(As Partial Fulfilment of the Five Year Integrated M.Sc. Programme)

in

Chemistry

on

Ashutosh Sahu

who has successfully completed the course of
studies as prescribed under the regulations and passed
the Examination in the session ending in June 2018,

in *First Class*.

Given this day, under the seal of the Institute
at Rourkela in the Republic of India,
the 21st Day of March 2021.

Registrar

Director

18/0883/415CY5017

National Institute of Technology Rourkela

Upon the recommendation of the Senate,
hereby confers the degree of

Integrated Master of Science

(Five Year Integrated M.Sc. Programme)

in

Chemistry

on

Ashutosh Sahu

who has successfully completed the course of
studies as prescribed under the regulations and passed
the Final Examination in the session ending in June 2020,
in *First Class.*

Given this day, under the seal of the Institute
at Rourkela in the Republic of India,
the 21st Day of March 2021.

Registrar

Director

भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
गुवाहाटी - 781039,भारत
Indian Institute of Technology Guwahati
Guwahati - 781 039, India

Dr. Abu Taleb Khan
Professor of Chemistry &
Former Vice-Chancellor of Aliah University
New Town, Kolkata – 700 156, West Bengal

Tel. No.: 0091 361 258 2305
Mobile No.: +91 94351 18593
Fax No.: 0091 361 258 2349
E-mail: atk@iitg.ernet.in / prof.atkhan@gmail.com

Date: 10th July, 2018

To Whom It May Concern

This is to certify that Mr. Ashutosh Sahu, 5 Year Integrated M.Sc. student from Department of Chemistry, NIT Rourkela bearing Roll No. 415CY5017 has done Summer Internship under my guidance from 15-05-2018 to 10-07-2018. He has worked in my laboratory on the research topic 'Regioselective Synthesis of 3-arylquinolines from α-aminoacetophenones and *trans*-β-nitrostyrenes.' He has done considerably good work during his internship time. He bears a good moral character.

I wish him success in life.

(Prof. Dr. Abu T. Khan)

Professor Abu T. Khan
Department of Chemistry
Indian Institute of Technology Guwahati
Guwahati-781039, Assam, India

NATIONAL INSTITUTE OF TECHNOLOGY
ROURKELA

Institute Leaving-cum-Migration-cum-Conduct Certificate

1.	*Name of the student (in full)*	:	**ASHUTOSH SAHU**
2.	*Roll Number*	:	**415CY5017**
3.	*Date of birth as per Institute record*	:	17-FEB-1996
4.	*Department*	:	**Chemistry**
5.	*Medium of Instruction*	:	ENGLISH
6.	*Date of Admission*	:	Jul 2015
7.	*Date of Leaving*	:	May 2020
8.	*Reason for Leaving*	:	Completion of the Course
9.	*Conduct*	:	Good
10.	*Degree awarded or to be awarded*	:	**MASTER OF SCIENCE**

The Institute has no objection to the candidate's prosecuting his/her further studies in any University / Institute or taking examination in any University, or pursuing any job or professional practice. He/She has paid all Institute fees.

Date of issue : **29 Jun 2020**

Deputy / Asst. Registrar (AC)

Assistant Registrar
(Academic)
National Institute of Technology
Rourkela-769008, Odisha

Dean (Academic)

DEAN (Academic)
National Institute of Technology
ROURKELA-769008 (INDIA)

For verification of contents, please log on to institute website www.nitrkl.ac.in

Novel Synthesis of g-C3N4 / TiO2 nanocomposite from Urea and Titanium Oxysulfate

Dissertation submitted to the

National Institute of Technology, Rourkela

in partial fulfilment of the requirements

of the degree of

Master of Science

in

Chemistry

by

AshutoshSahu

Roll No: - 415CY5017

Under the supervision of

Dr. Aparna Mondal

May, 2020

Department of Chemistry
National Institute of Technology, Rourkela

Certificate

This is to certify that the work presented in this dissertation entitled **''Novel *Synthesis of g-C_3N_4 / TiO_2 nanocomposite from Urea and Titanium Oxysulfate*''** by ***Ashutosh Sahu*** bearing Roll Number ***415CY5017***, is a record of original research carried out under my supervision and guidance in partial fulfilment of the requirements of the degree of ***Master of Science in Chemistry***.

Supervisor's Signature

Department of Chemistry,

NIT Rourkela.

Declaration

Myself, *Ashutosh Sahu*, Roll Number *415CY5017*, hereby declare that this dissertation entitled " Novel *Synthesis of g-C_3N_4 / TiO_2 nanocomposite from Urea and Titanium Oxysulfate*" represents my original work carried out as a postgraduate student at NIT Rourkela and to the best of my knowledge contains no material previously published or written by another person nor any material presented for the award of any other degree or diploma at NIT Rourkela or any other institution. Any contribution made to this research by others with whom I have worked at NIT Rourkela or elsewhere is explicitly acknowledged in the dissertation. Works of other authors cited in this dissertation have been duly acknowledged under the section "Bibliography".

May, 2020
Ashutosh Sahu
415CY5017
NIT, Rourkela.

Acknowledgements

I would like to express my heartfelt gratitude to Dr. Aparna Mondal, Faculty, Department of Chemistry, NIT Rourkela, my project supervisor for her encouragement and valuable guidance through the completion of my project

I would like to thank all my lab mates for their unending help throughout my project.

Finally, I would like to thank all the people who have helped me by giving their instruments.

Abstract

Nano composite of $g\text{-}C_3N_4$ / TiO_2 has been prepared from urea and an inorganic precursor of titania by using precipitation method. The following samples have been characterized using XRD and UV-Vis spectroscopy. Incorporation of graphitic carbon nitride has been effected the properties of the nanocomposite. The XRD data indicate that the nanocomposite has crystallite size about 8 nm. Microstructural study confirms that, the TiO_2 nanocrystals are in interfacial contacts with graphitic carbon nitride. Combining graphitic carbon nitride and titania in the nanocomposites, resulted in enhancement of the adsorption attitudetowards organic pollutants (dyes) which is related with their typical surface properties. The Nanocompositealso exerts a substantial effect on the photocatalytic activity toward methylene blue under visible light.

Keywords: Titania, Graphitic Carbon Nitride; Wet chemical route; Photocatalyst

Contents

1. Introduction

A breakthrough in photocatalysis research that has remained in the focus is environmental protection. Among all the photocatalysts, TiO_2 is by far the most widely studied photocatalyst because of its non-toxicity,stable and unsolvable nature in water with very good structural and mechanical properties[1–3]. But due to its high band gap energy (3.2 eV for anatase and 3.0 eV forrutile) the activity of TiO_2 makes it less economical for practical UV light applications[4,5]. In addition to that high recombination rate of photo induced electrons-holes extremely hinder its practical application. So, for practical application it is essential to make better photocatalysts which possess higher activity under visible light [6].Over the decadesdifferent approaches on TiO_2have been taken to overcome this problem via doping which influences the photo-responsiveness of the photocatalyst[7–9].Graphitic carbon nitride (g-C_3N_4) belongs to a family of carbon nitride compounds with general formla near to C_3N_4. Due to special semiconductor properties of carbon nitrides, they show unexpected catalytic activity[10]. Ultrathin g-C_3N_4nanosheet has attracted tremendous attention among researchers because of its high intrinsic photo resposiveness and high stability under physiological conditions and good biocompatibility[11]. Composites of g-$C_3N_4$with metal oxides have shown to increase photocatalytic activity. Loading of noble metals on the surface of g-C_3N_4 have shown the best ways to suppress the rate of recombination of photo generated electron-hole pairs. But, the fact is that the noble metals are costly [12]. So it is necessaryto figure a way out to develop g-C_3N_4 basedefficient and low cost photocatalyst which is active under visible light[13–16]. In this study, by using precipitation we have developed a novel method to synthesize a g-C_3N_4/TiO_2 composite by taking urea as a precursor to produce g-C_3N_4 and where $TiO_2$is being precipitated on it. Different techniquesare used for the characterization of the following sample.

2. Experimental Section

2.1 Chemicals :-

Urea ($(NH_2)_2CO$), Titanium oxysulfate ($TiOSO_4$), 30% ammonia solution.

2.2Synthesis of Graphitic Carbon Nitride (g-C3N4)

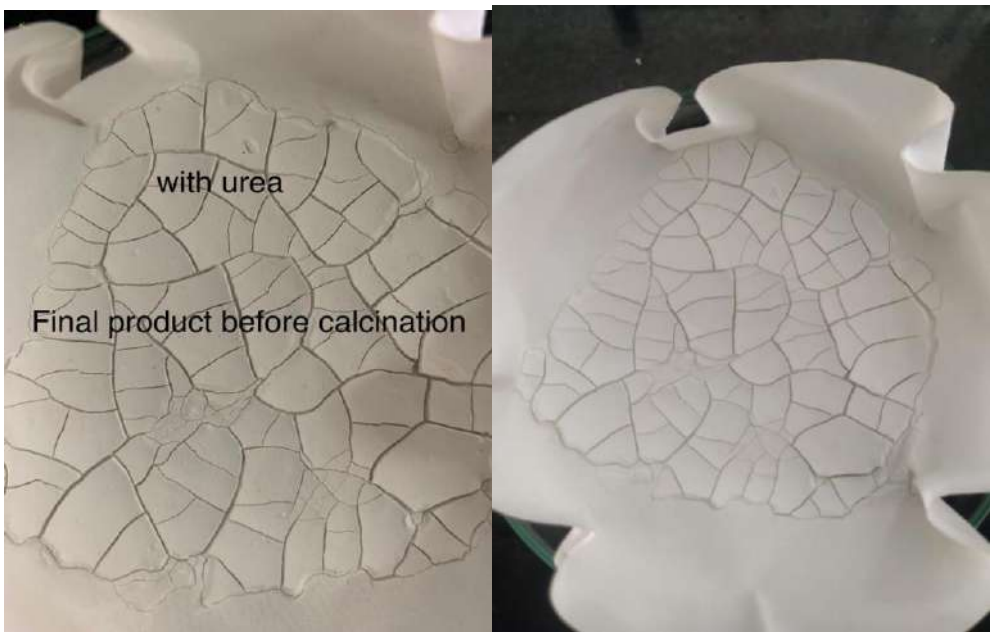
g-C_3N_4 was prepared by directly heating urea in ceramic crucible covered by aluminium wrapper to prevent sublimation. 12g of urea was taken in a ceramic crucible and then heated in a muffle furnace at 450°C for 60 minutes with heating rate of 14°/min. Then the sample was cooled to room temperature. The prepared solid powder was shown in Figure 1. The obtained powder was pale yellow in colour.

Figure 1. g-C_3N_4

2.3 Synthesis of g-C_3N_4/TiO_2nanocomposite.

The nanocomposite g-C_3N_4/$TiO_2$was prepared in the ratio of 6:1; 0.02 M solution of titanium oxysulfate was prepared in 100 ml of distilled water followed bystirring until clear solution appears. To the above solution 0.8g of prepared g-$C_3N_4$was added and sonicated for 45 minutes

to make a homogenous solution. After this, the mixturewas stirred magnetically for 60 minutes. To precipitate TiO_2on g-C_3N_4, 30% NH_3 solution was added drop wise to the mixture with the help of a burette. The reaction continues until pH of the solution reaches[7]. The precipitate formed in the solution was then kept and aged for 48 hours. The precipitate was filtered by centrifugation and washed with distilled water several times. The residue was collected on petri dish and dried in an oven at 70°C for one day. The solid or composite formedwas crushed into powder using mortar pastel. The prepared nanocomposite was annealed at 450°Cfor 120 minutes with heating rate of 12°/min in a muffle furnace usingceramic crucible. The obtained powder was used for further characterization.



(a) (b)

Figure 2. (a) g-C_3N_4 / $TiO_2$and (b) 100°Cheated g-C_3N_4 / TiO_2.

3. Results and Discussion

3.1 X-ray diffraction (XRD)

X-ray diffraction pattern of prepared g-C3N4 and g-C3N4/TiO2 were carried outon Philips X'Pert Pro-diffractometer using Cu-Kα radiation. The characteristic sharp peak at 2θ = 27.3° and 14.7° (Figure 3a) corresponding to (002) and (100) planes confirms formation on g-C3N4

nanosheets. The wide peak at 14.7° indicates that the g-C3N4 nanosheets were disordered and very thin. Since, during the thermal process the planner size of the g-C3N4 gets decreased.

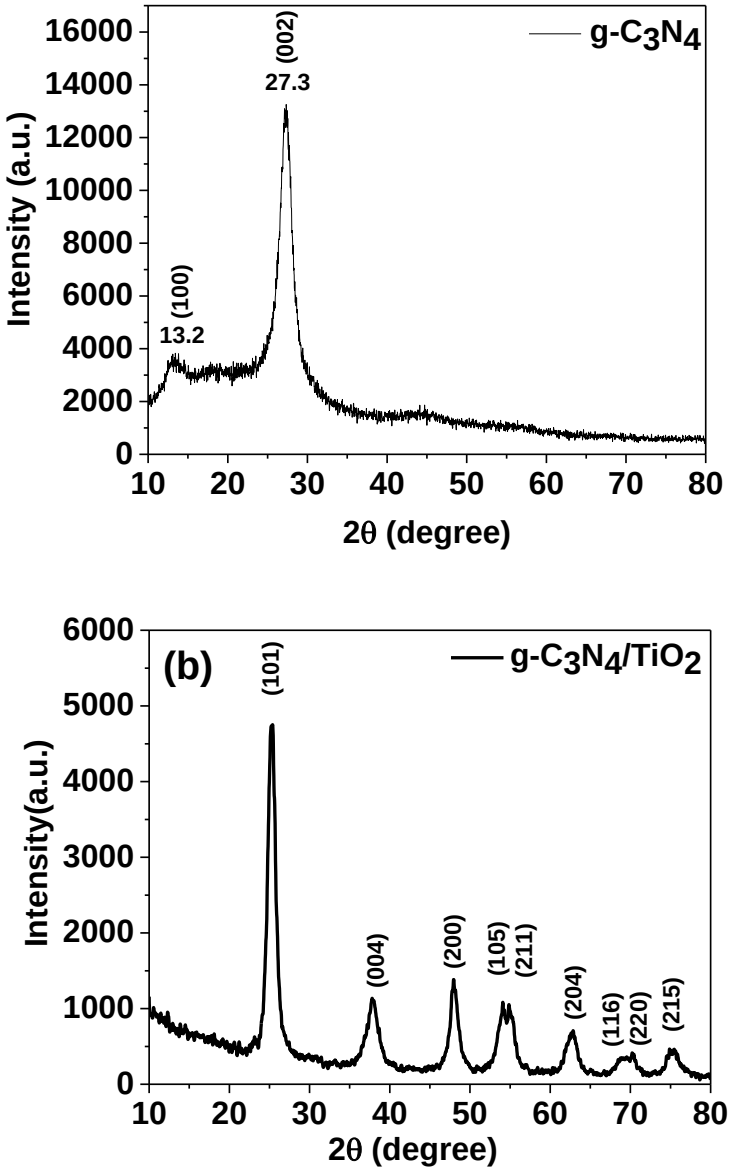


Figure 3. (a) As prepared g-C_3N_4 / $TiO_2$and (b) 100°Cheated g-C_3N_4 / TiO_2.

On the other hand, the composites g-C_3N_4/TiO_2, XRD peaks at about2θ = 25.2°, 37.7°, 47.9°, 53.9°, 55.0°, 62.9°, 69.0°, 70.1°, and 75.1°can be observed, which are respectively corresponding to (101), (004), (200), (105), (211), (204), (116), (220), and (215) crystal planes of anatase TiO_2(JCPDS card no-21-1272). No characteristic diffraction peak of g-$C_3N_4$was observed. So, g-C3N4 nanosheets have almost no effect on the anatase structure of TiO_2. The

crystallite size of the TiO_2 in the composite is 7.47 nm, calculated using Scherrer's equation (1),

$$D_{hkl} = \left[\frac{0.94\lambda}{\beta_{hkl} Cos\theta}\right] \quad (1)$$

Where, λ is the wavelength and β_{hkl} is the FWHM (full width at half maximum)

3.4. Photoluminescence study

The photoluminescence spectra were taken in a FluoroMax-4 spectrophotometer by using excitation wavelength of 370nm. The photoluminecence intensity of the g-C_3N_4 / TiO_2 composite was much lower compared to g-C_3N_4 because the lower recombination rate on charge carriers' (electron and holes) and that make the composite could be a good photocatalyst in the visible range of spectrum.

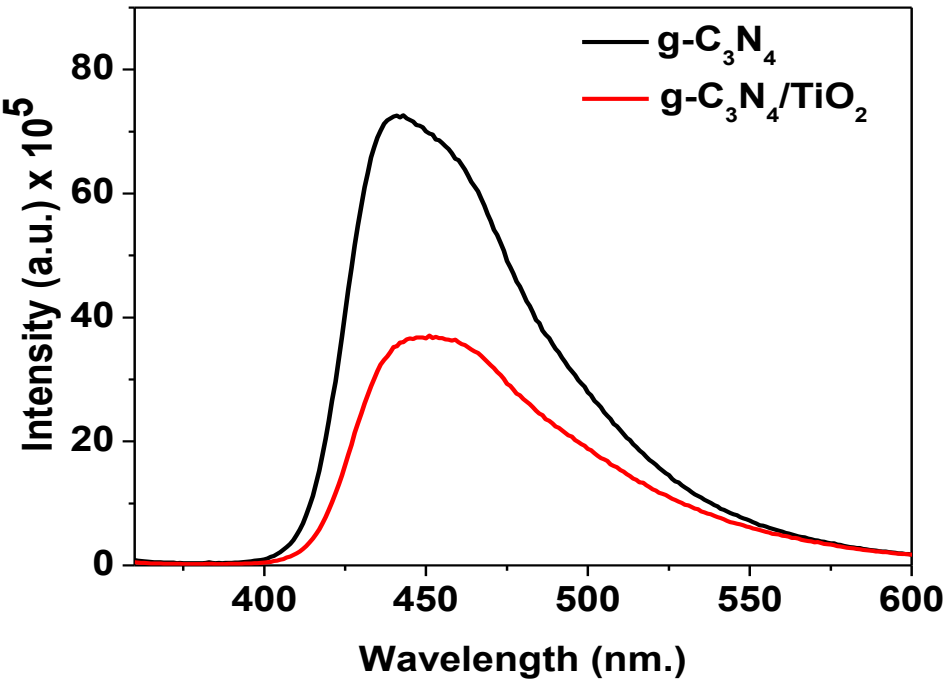


Figure 5.photoluminescence spectra of g-C_3N_4 and g-C_3N_4 / TiO_2 nanocomposite.

4. Photocatalytic Application

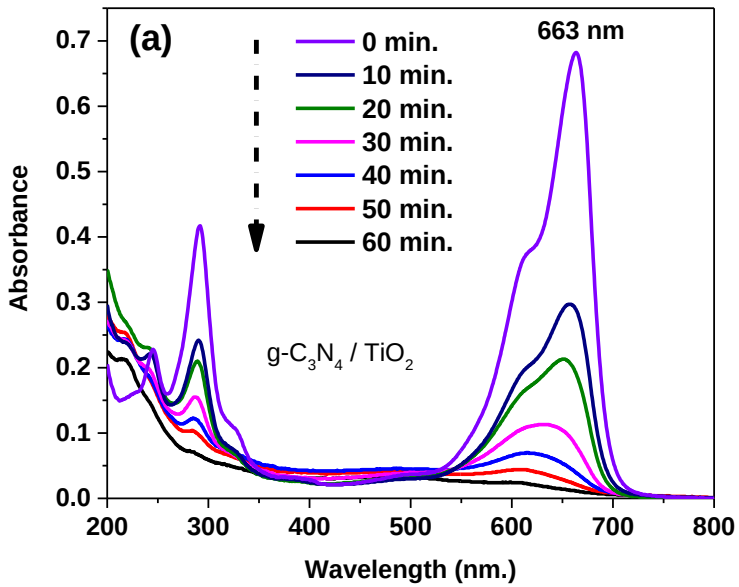
4.1. Experimental Section

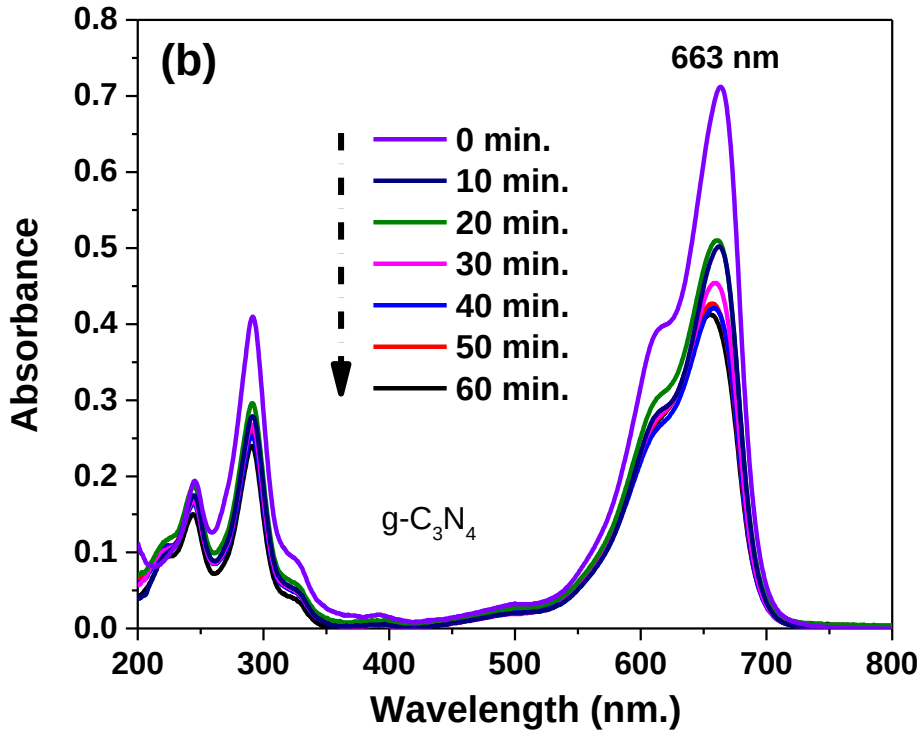
Photocatalytic performance of the nanocomposite was calculated by the extent of degradation of methylene blue (MB) in aqueous solution under visible light. First, 50 mL of $4X10^{-5}$M MB solution was taken and 30 mg photocatalyst was added to it, then the solution wasplaced under visible light for photodegradation. The suspension waskept stirring at 450 rpm for better mixing. The experiments using sunlight was carried out for a period ranging from 0 min. to 60 min. The solution was then extracted from the reaction mixture at a distinct time interval and centrifuged. The concentration of MB in the residual solutions was then analysed using UV-Vis spectrophotometer (λ_{max}= 663nm). After, the degradation efficiency is evaluated using the following equation;

$$\% \text{ Degradation} = (1 - \frac{C_t}{C_i}) \times 100\%$$

where,$C_i$and C_t signifies the conc. of the dye solution at initial and after irradiation time t, respectively.

4.2. Discussion





Eve

Figure 6.UV-Vis absorption spectra of methylene blue solution at different time interval.

We have estimated the photocatalytic performance of the g-C_3N_4 and g-C_3N_4 / TiO_2 nanocomposite in terms of their degradation efficiency using MB aqueous solution under sunlight. The percentage of removal using g-C_3N_4 / TiO_2catalyst measured after 60 min. of sunlight irradiation is 95% where it was only 45% for g-C_3N_4. Therefore, the increase in photodegradation rate was due to combination. The UV- Vis absorption spectra of MB dye in aqueous solution at different time interval were illustrated in Figure 6. In first 10 min. there was 56% of MB degradationfor the g-C_3N_4 / TiO_2 nanocomposite where it was only 29% for the g-C_3N_4.Therefore, combination of g-$C_3N_4$with TiO_2creates a synergistic effect, which eventually improves the adsorption of the MB dye on the catalysts surface as well as the photodegradation rate of the dye. The degradation profile has been shown in Figure 7.

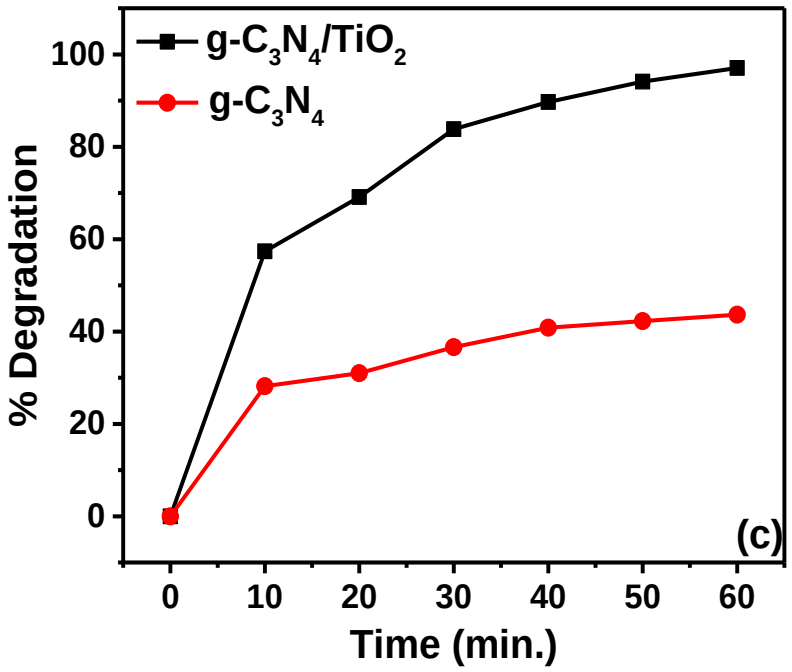


Fig. 7.MB photodegradation profile with irradiation time using g-C_3N_4/TiO_2 andg-C_3N_4catalyst.

Conclusion

By using asimple starting material we have developed a synthetic route for g-C_3N_4 /TiO_2 composite. The XRD data shows formation of anatase TiO_2 lattice on the nanosheet of g-C_3N_4. The UV-Vis absorption spectra showed red shift for the composite. Finally, the prepared composite used for the photodegradation reaction of methylene blue under visible light showed 95% degradation of the dye in just 60 min .

Future work

Further characterizationcan be doneof theg-C_3N_4 and g-C_3N_4 /TiO_2 composite. Vast range of photocatalytic applications can be performed using the nanocomposite of other different commercial dyes. Different parameters like pH, catalyst dosage, concentration of dye and their effects on the photocatalytic process can be studied.

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