Criterion-1: Curricular Aspects

Key Indicator – 1.3: Curriculum Enrichment

Metric: 1.3.3

Programme: M.Sc. Chemistry

Syllabus	https://www.du.ac.in/uploads/RevisedSyllabi1/Annexure-198%20M.Sc.%20Chemistry%2018July%202019%20Final.pdf
Sample Project Reports	Annexure

Annexure

Sample Project Reports

SYNTHETIC DEVELOPMENTS AND APPLICATIONS OF TETRABENZOPORPHYRINS

A Project Report Submitted in Partial Fulfillment for The Award of M.Sc. Degree In Chemistry

(CHEM -4106)

Submitted By

NAMAN GUPTA

M.Sc. (F) Chemistry

Inorganic Specialization, Group -IV

Under The guidance Of

Dr. SANDEEP KAUR

(ASSOCIATE PROFESSOR)

Department Of Chemistry

University Of Delhi

Delhi -110007

April - 2022

DECLARATION BY THE CANDIDATE

The project entitled "**SYNTHETIC DEVELOPMENTS AND APPLICATIONS OF TETRABENZOPORPHYRINS"** is in partial fulfillment of the requirements of Paper no. 4106 (Inorganic Chemistry Project and Evaluation) for the award of the degree of Master of Science (M.Sc.) in Chemistry of the University of Delhi.

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Naman Gupta
M.Sc. Chemistry
Department of chemistry
University of Delhi
Delhi-110007

CERTIFICATE

This is to certify that the project entitled "Synthetic Developments and Applications of Tetrabenzoporphyrins" has been compiled by Mr. NAMAN GUPTA, student of M.Sc. (F) Chemistry, Inorganic Specialization, Semester IV (Paper no. 4106, Examination Roll Number – 20056746025) is purely based on literature survey towards the partial fulfillment of the requirements for the award of the degree of Master of Science (M.Sc.) in chemistry from University of Delhi.

Dr. SANDEEP KAUR

Associate Professor

Department of Chemistry

University of Delhi

Delhi - 110007

PROF. A.K. PRASAD

Head of Department

Department of Chemistry

University of Delhi

Delhi – 110007

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I also appreciate the faculty and the Department of Chemistry for providing the work culture and environment that has given us the feel of professional corporate life.

Special thanks to all our teachers, friends, and family for their invaluable support.

NAMAN GUPTA

M.Sc. Chemistry

Examination Roll No.: 20056746025

Department of Chemistry

University of Delhi

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LIST OF ABBREVIATIONS

1.BCOD: Bicyclo[2.2.2.]octa-2,5-diene

2. BINAP: (2,2`-bis(diphenylphosphino)-1,1`-binaphthyl)

3. BP: Benzoporphyrins

4. BTMSA: bis-(trimethylsilyl)acetylene

5. CP: (1,4:8,11:15,18:22,25-Tetraethano-29H,31H-terabenzo[b,g,l,q]porphyrin)

6. DBU: 1,8-Diazabicyclo[5.4.0]undec-7-ene

7. DDQ: 2,3-Dichloro-5,6-dicyano-1,4-benzoquinone

8. DMF: Dimethylformamide

9. FF: Fill factor

10. HOMO: Highest occupied molecular orbitals

11. LAH: Lithium aluminium hydride

12. LCD: Liquid crystal display

13. m-CPBA: meta-chloroperoxybenzoic acid

14. OFET: Organic field-effect transistors

15. OSCs: Organic solar cells

16. PDT: Photodynamic therapy

17. PV: photovoltaic cells

18. ROS: Reactive oxygen species

LIST OF FIGURES

1. ABSTRACT

TBPs and their derivatives are one of the most interesting topics in recent years because of their large potential and utility in inorganic chemistry, organic chemistry, material sciences, and also in medicinal chemistry. In Organic chemistry, these TBPs and their derivatives are suitable for OFETs devices and also in LCDs. In photodynamic therapy, these porphyrin units play an important role as a photosensitizer and help in the treatment of cancer. Owing to their vast applications researchers have developed various methods for their synthesis as the synthesis of these compounds is important for their maximum utilization. There has always been a problem in synthesizing these compounds so much research is still going on their development. In this report, I have discussed some methods of synthetic developments of TBPs and their derivatives along with their application.

PHOTOCATALYTIC REDUCTION OF CO_2 USING MANGANESE COMPLEXES

A Project Report Submitted in Partial Fulfillment for the Award of M.Sc. Degree In Chemistry

(**CHEM-4106**)

Submitted By

PRAJJWAL SHARMA

M.Sc. (F) Chemistry

Inorganic Specialization, Group-IV

Examination Roll Number- 20036746064

Under The Guidance Of

Dr. SANDEEP KAUR

(Associate Professor)

Department of Chemistry

University of Delhi

Delhi- 110007

April, 2022

DECLARATION BY THE CANDIDATE

The project entitled "**PHOTOCATALYTIC REDUCTION OF CO_2 USING MANGANESE COMPLEXES**" is in partial fulfillment of the requirements of Paper no. 4106 (Inorganic Chemistry Project and Evaluation) for the award of degree of Master of Science (M.Sc.) in Chemistry of the University of Delhi.

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- I am solely responsible for all the plagiarized texts, tables and figures,if any.

Prajjwal sharma
M.Sc. Chemistry (Final)
Department of Chemistry
University of Delhi
Delhi-110007

CERTIFICATE

This is to certify that the project report entitled "**PHOTOCATALYTIC REDUCTION OF CO_2 USING MANGANESE COMPLEXES**" has been compiled by MR. **PRAJJWAL SHARMA** , **student of M.Sc. (F) Chemistry, Inorganic Specialization, Semester IV (Paper no. 4106, Examination Roll Number-20036746064)** is purely on the basis of literature survey towards the partial fulfillment of the requirements for the award of degree of Master of Science (M.Sc.) in Chemistry from University of Delhi.

Dr. SANDEEP KAUR
Associate Professor
Department of Chemistry
University of Delhi
Delhi-110007

Prof. ASHOK K.PRASAD
Head of Department
Department of Chemistry
University of Delhi
Delhi-110007

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This dissertation work has been accomplished under the expert guidance of **Dr. SANDEEP KAUR**, Associate Professor, Department of Chemistry, University of Delhi, and New Delhi. I would like to express my sincere gratitude to her for her constant valuable guidance, constructive criticism and encouragement. I shall be indebted to her for this great and valuable

mentorship.

I am grateful to the Head of the Department, Prof. for his cooperation and guidance. I would also like to thank all the teachers of the Department of Chemistry, University of Delhi for their advice and support.

I would also like to thank Dr. D.T. Masaram, Dr. S. Deka and Dr. F. Hussain for their constant support and advice during the project. Lastly, I thank my family and friends and for their constant encouragement without which this work would not have been possible.

Signature

Prajjwal sharma

CONTENTS

LIST OF ABBREVATIONS

ACN	Acetonitrile
bpy	2 ,2'-bipyridine
Cat	Catalyst
CS	Catalytic Selectivity
DCM	Dichloromethane
DMA	Dimethylacetamide
DMF	N, N-dimethyl formamide
D	Electron Donor
PN	Phosphinoaminopyridine
PS	Photosensitizer
SOL	Solvent
TM	Transition Metal
TON	Turn Over Number
TOF	Turn Over Frequency
TEA	Triethylamine
TEOA	Triethanolamine
THF	Tetrahydrofuran
^{1}MLCT	Singlet metal-to-ligand charge transfer
^{3}MLCT	Triplet metal-to-ligand charge transfer
dmb	4,4'-dimethyl-bpy
ppy	2-phenylpyridine
tpy	2,2 6,2-terpyridine
phen	1,10-phenanthroline
N^N	diimine ligand

ABSTRACT

For the upcoming decades, fossil fuels will may not continue to dominate the energy market. It is critical to develop clean techniques for turning CO_2 back into a high-energy-density liquid fuel in order to minimize the massive amounts of CO_2 discharged into the environment. While still an emerging field, manganese-based catalysts can be successfully integrated into electrochemical and photo electrochemical devices for CO_2 reduction. Manganese shows similar photocatalytic properties as Rhenium, it could be a replacement for rare earth metals. This review summarizes the basic components of photocatalysis and development in the field of manganese as an emerging photocatalyst.

INORGANOMETALLICS (TRANSITION METAL-METALLOID COMPLEXES) AND THEIR APPLICATION IN CATALYSIS

A Project Report Submitted In Partial Fulfillment For The Award Of M.Sc. Degree In Chemistry

(CHEM-4106)

Submitted By

RISHITA SINGH

M.Sc. (F) Chemistry

Inorganic Specialization, Group-III

Examination Roll Number- 20025746024

Under The Guidance Of

Dr. SANDEEP KAUR

(Associate Professor)

Department of Chemistry

University of Delhi

Delhi- 110007

April, 2022

DECLARATION BY THE CANDIDATE

The project entitled "**INORGANOMETALLICS (TRANSITION METAL–METALLOID COMPLEXES) AND THEIR APPLICATION IN CATALYSIS**" is in partial fulfillment of the requirements of Paper no. 4106 (Inorganic Chemistry Project and Evaluation) for the award of degree of Master of Science (M.Sc.) in Chemistry of the University of Delhi.

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- I am solely responsible for all the plagiarized texts, tables and figures, if any.

Rishita Singh
M.Sc. Chemistry (Final)
Department of Chemistry
University of Delhi
Delhi-110007

CERTIFICATE

This is to certify that the project report entitled "**INORGANOMETALLICS (TRANSITION METAL-METALLOID COMPLEXES) AND THEIR APPLICATION IN CATALYSIS**" has been compiled by Ms. **RISHITA SINGH**, **student of M.Sc. (F) Chemistry**, **Inorganic Specialization**, **Semester IV (Paper no. 4106**, **Examination Roll Number-20025746024)** purely on the basis of literature survey towards the partial fulfillment of the requirements for the award of degree of Master of Science (M.Sc.) in Chemistry from University of Delhi.

Dr. SANDEEP KAUR
Associate Professor
Department of Chemistry
University of Delhi
Delhi – 110007

Prof. ASHOK K. PRASAD
Head of Department
Department of Chemistry
University of Delhi
Delhi - 110007

ACKNOWLEDGEMENTS

This dissertation work has been accomplished under the expert guidance of **Dr. SANDEEP KAUR**, Associate Professor, Department of Chemistry, University of Delhi, and New Delhi. I would like to express my sincere gratitude to her for her constant valuable guidance, constructive criticism and encouragement. I shall be indebted to her for this great and valuable mentorship. I am grateful to the Head of the Department, Prof. Ashok K. Prasad for his cooperation and guidance. I would also like to thank all the teachers of the Department of Chemistry, University of Delhi for their advice and support. I would also like to thank Dr. D.T. Masaram, Dr. S. Deka and Prof. F. Hussain for their constant support and advice during the project. Lastly, I thank my family and friends and for their constant encouragement without which this work would not have been possible.

Signature
Rishita Singh

CONTENTS

ABSTRACT

The project aims to introduce Inorganometallic Chemistry as a distinct field of non-metal (other than H, C, N, O, S, and halogen) and metalloid–metal element chemistry with potential significance to organometallic chemistry that has been recognized over time. While the formation and breaking of transition metal (TM) carbon bonds are important in the catalysis of organic compounds, the reactivity of inorganometallic species, such as those involving the transition metal (TM) metalloid (E) bond, play a vital role in metalloid derivative conversions catalysed by the TM complex. It presented the background of inorganometallic catalysis and its development over the years. The significance of inorganometallic having Transition metals benefits from unconventional electronic and steric environments as well as molecular functionalities provided by main group metal and metalloid supporting ligands. E bonds in catalytic transformations of compounds (mostly from groups 13, 14, 15, and 16). The most recent advances in the catalytic use of transition metal complexes with an M–E bond (where, E is major group metal or metalloid element) stabilized by a multidentate ligand are summarised. Transition metal properties frequently result in remarkable catalytic activity, distinct product selectivity, and new molecular transformations. This viewpoint highlights the potential utility of main group metal and metalloid compounds in synthetic chemistry as a new class of supporting ligands for transition metal catalysts. The review of inorganometallic catalysis summarises recent advances in catalytic methods for the synthesis of organometalloid compounds and their applications in advanced organic synthesis as part of tandem processes. Transition metals benefit from unconventional electronic and steric environments as well as molecular functionalities provided by main group metal and metalloid supporting ligands.

RECENT PROGRESS IN THE APPLICATION OF NANOMATERIALS IN ANALYSIS AND MONITORING OF EMERGING CHEMICAL POLLUTANTS

A Project Report Submitted in the Partial Fulfillment for the Award of M.Sc. Degree in Chemistry

(CHEM-4106)

Submitted by

SONAL RAJPUT

M.Sc. (F) Chemistry

Inorganic Specialization, Group-III

Examination Roll Number- 20056746047

Under the Guidance of

Dr. SANDEEP KAUR

(Associate Professor)

Department of Chemistry

University of Delhi

Delhi - 110007

April, 2022

DECLARATION BY THE CANDIDATE

The project entitled "**Recent Progress In The Application Of Nanomaterials In Analysis And Monitoring Of Emerging Chemical Pollutants**" is in partial fulfillment of the requirements of Paper no. 4106 (Inorganic Chemistry Project and Evaluation) for the award of degree of Master of Science (M.Sc.) in Chemistry of the University of Delhi.

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I stand solely responsible for all the plagiarized text, tables and figures, if any.

Sonal Rajput
M.Sc. Chemistry (Final)
Department of Chemistry
University of Delhi
Delhi-110007

CERTIFICATE

This is to certify that the project report entitled "**Recent Progress In The Application Of Nanomaterials In Analysis And Monitoring Of Emerging Chemical Pollutants**" has been compiled by Ms. **SONAL RAJPUT**, **student of M.Sc. (F) Chemistry, Inorganic Specialization, Semester IV (Paper no. 4106, Examination Roll Number-20056746047)** is purely on the basis of literature survey towards the partial fulfillment of the requirements for the award of degree of Master of Science (M.Sc.) in Chemistry from University of Delhi.

Dr. SANDEEP KAUR
Associate Professor
Department of Chemistry
University of Delhi
Delhi- 110007

Prof. ASHOK K. PRASAD
Head of Department
Department of Chemistry
University of Delhi
Delhi-110007

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I would like to thank my parents and my friends who helped me a lot in finalizing this project within the limited time frame.

CONTENTS

ABSTRACT

Emerging chemical pollutants (ECPs) are newly recognized naturally or synthetically occurring compounds that are not yet covered by regular routine monitoring and regulatory programs and have known or suspected adverse effects on humans and the environment. Due to the complicated sample matrices, extremely low environmental levels, and the "emerging" nature of ECPs, current research on ECPs is substantially hindered by the lack of analytical methodologies. The application of nanomaterials (NMs) to the analytical problem of ECPs is a thriving field of research. In the consecutive years, this field has continued to rapidly develop with many new materials and technologies emerging. This paper therefore reviews recent progress in the applications of nanomaterials in the analysis and monitoring of ECPs. Various types of NMs and analytical techniques are covered. Notably, we pay special attention to newly developed nanomaterials, such as carbon dots, MXenes, carbon nanotubes, metal organic frameworks and different analytical techniques (e.g., electrochemical sensing, fluorescent detection, colorimetric detection, adsorption, photocatalysis). We also discuss the current challenges and give our perspectives on the future in this rapidly developing area.