

Conjugated polymer nanocomposites for electrochemical hydrogen production and supercapacitor applications



Thesis Submitted in Partial Fulfilment for
the Award of Degree

Doctor of Philosophy

By

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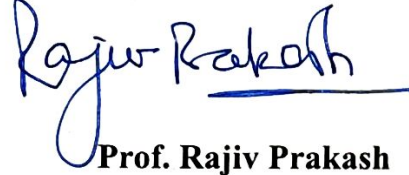
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I, *Ajay Kumar* certify that the work embodied in this thesis is my own bonafide work and carried out by me under the supervision of *Prof. Rajiv Prakash* from December 2016 to December 2022 at the *School of Materials Science & Technology*, Indian Institute of Technology, Banaras Hindu University, Varanasi. The matter embodied in this thesis has not been submitted for the award of any other degree/diploma. I declare that I have faithfully acknowledged and given credits to the research workers wherever their works have been cited in my work in this thesis. I further declare that I have not willfully copied any other's work, paragraphs, text, data, results, etc., reported in journals, books, magazines, reports, dissertations, theses, etc., or available at websites and have not included them in this thesis and have not cited as my own work.

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Acknowledgement

I would like to extend my deepest sincerest gratitude to all the people who helped in any manner, who have shared the effort and knowledge in order to make this research a reality. Whatever has been accomplished and whatever has been the product of every endeavour, there is a great source of all effort, striving, guidance and gracious blessings without whom this task would have been impossible.

First and foremost, I would like to pay the homage to the founder of Banaras Hindu University, Pandit Madan Mohan Malviya, who made this this magnificent sanctuary to attain spiritual, intellectual, and scientific understanding of this huge cosmos.

*I would like to take this opportunity to offer my sincere gratitude to my respected supervisor **Professor Rajiv Prakash**, School of Materials Science & Technology, IIT (B.H.U.), Varanasi, for his unwavering support, insightful advice, and encouraging words throughout my time working with his research team. I was able to gain the knowledge of the topic because of his consistent encouragement, intellectual stimulation, astute advice, and incredibly valuable ideas and suggestions from the beginning to the end. I have been inspired by his thoughtful advice, wise cautions, intense interest, ongoing assistance, and kind demeanour.*

*I would like to express my sincere and whole hearted gratitude to **Prof. P. Maiti, Dr. A. K. Singh, Dr. C. Rath, Dr. C. Upadhyay, Dr. B. N. Pal, Dr. Ashish Kumar Mishra, Dr. Sanjay Singh, Dr. Shravan Kumar Mishra and Dr. Nikhil** (School of Materials Science and Technology, IIT-BHU, Varanasi) for discussion during seminars and valuable suggestions given by them. I am indeed obliged and sincerely thankful to my RPEC member **Dr. Indrajeet Sinha**, Department of Chemistry, IIT (B.H.U.) for his guidance and untiring attention right from the inception to the successful completion of assigned research work. Without close cooperation, most of the findings in this thesis would not have been possible. I am appreciative to the anonymous reviewers who repeatedly helped me suggesting changes and guided me on my articles. Their feedback allowed me to improve articles by giving them a more polished finish.*

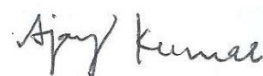
Acknowledgement

*My acknowledgement really deserves the special mention of my seniors in the lab who have taught me the lab culture and basic principles of the journey of research. I would like to acknowledge **Dr. Narsingh Raw Nirala, Dr. Uday Pratap Azad, Dr. Monika Srivastava, Dr. Ashish Kumar, Dr. Rajiv Kumar Pandey, Dr. Gopal Ji, Dr. Neeraj Giri, Dr. Madhu Tiwari, Dr. Kashish, Dr. Preeti Tiwari, Dr. Manish Kumar Singh and Dr. Richa Mishra, Dr. Vinita, Dr. Chandrajeet Verma, Dr. Ravi Prakash Ojha** for all their support and motivation during the initial days of my PhD. I express my special thanks to **Dr. Ashish Kumar** for his guidance, motivation and valuable suggestions during the tenure my PhD.*

*Also, I am thankful to my lab fellows, specially **Vineet Kumar Mall, Nikhil, Aniruddha, Subhajit, Priya, Shweta, Saurabh, Rajpal, Shipra, Nupur, Radhe** for their helping behaviour. A special thanks to **Saurabh** for his help during my work. It's my fortune to gratefully acknowledge to my research seniors and juniors from the School of Materials Science & Technology **Dr. Om Prakash, Pragyan, Deepti, Bishu Pada Majee, Abhay Narayan, Manish, Ravi Prakash, Raman Hasariya** from the list is endless...thanks to one and all. Very special mentioned of my friends who helped me directly or indirectly throughout the work. I am thankful to all non-teaching staff of SMST, IIT (BHU) and CIFC for their cooperation at all levels. I also acknowledge **Shiv Charan Saroj (Shiv Bhaiya)** for his helping hand.*

I gratefully acknowledge UGC, NewDelhi for providing me the necessary funding and fellowship to pursue the research work.

*I express my indebtedness to my parents **Smt. Basmati Devi and Shri Teemal Prasad** and sisters for their love, affection, and support during every moment in my life. This work would not have been possible without the grace of the Almighty "Maa Durge, Maa Saraswati and Baba Kashi Vishwanath".*



(Ajay Kumar)

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List of Acronyms/Abbreviations

μA	:	Microampere
μL	:	Microlitre
μM	:	Micromolar
ν	:	Scan rate
$^{\circ}\text{C}$:	Degree Celsius
0D	:	Zero dimensional
1D	:	One dimensional
2D	:	Two dimensional
3D	:	Three dimensional
A	:	Effective surface area
APS	:	Ammonium persulphate
Aq.	:	aqueous
C	:	Concentration
CD	:	Charge-discharge
cm	:	Centimeter
Conc.	:	Concentrated
CP	:	Conjugated polymer
CV	:	Cyclic Voltammetry
D	:	Diffusion coefficient
DI	:	Deionized
DPV	:	Differential Pulse voltammetry
ECSA	:	Electrochemical active surface area
EDS/ EDAX	:	Energy dispersive X-ray spectroscopy
EIS	:	Electrochemical impedance spectroscopy
eV	:	Electron volt
FTIR	:	Fourier transform infrared

List of Acronyms/Abbreviations

GCD	:	Galvanic charge-discharge
GCE	:	Glassy Carbon Electrode
GO	:	Graphene oxide
h / hr	:	Hour(s)
LSV	:	Linear sweep voltammetry
Min	:	Minute(s)
mM	:	millimolar
ms	:	Millisecond(s)
nm	:	nanometer
NFS/NFPS	:	NASICON structure $\text{Na}_3\text{Fe}_2(\text{SO}_4)_2\text{PO}_4$
NFS(Ni)	:	Ni-doped NASICON structure $\text{Na}_3\text{Fe}_2(\text{SO}_4)_2\text{PO}_4$
NPs	:	Nanoparticles
PANi	:	Polyaniline
PCz	:	Polycarbazole
PCz-WO ₃	:	Polycarbazole/tungsten oxide composite
PIn	:	Polyindole
PPy	:	Polypyrrole
PPy/NFS	:	Polypyrrole/NASICON structured NFS composite
PPy/NFS(Ni)	:	Polypyrrole/Ni-doped NFS composite
R _{ct}	:	Charge transfer resistance
RT	:	Room temperature
s	:	Second
SAED	:	Selected area electron diffraction pattern
S/N	:	Signal to noise ration
SEM	:	Scanning electron microscopy
T	:	Temperature

List of Acronyms/Abbreviations

TEM	:	Transmission electron microscopy
TGA	:	Thermogravimetric analysis
TMDs	:	Transition metal dichalcogenides
UV-Vis	:	UV Visible
V	:	Volt
WO ₃	:	Tungsten oxide
XRD	:	X-ray diffraction
XPS	:	X-ray photoelectron spectroscopy