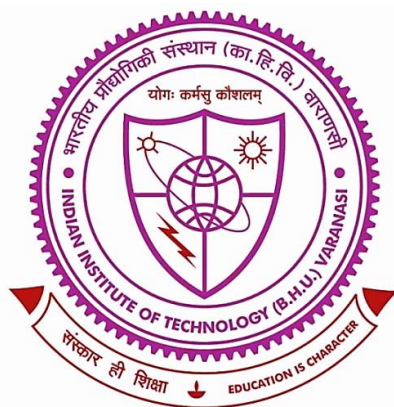


# A Novel Approach for the Synthesis of *N*-based Heterocyclic Compounds and their Electrochemical Studies



Thesis submitted in partial fulfillment for the  
Award of Degree

**Doctor of Philosophy**

By

*Neetu Verma*

DEPARTMENT OF CHEMISTRY  
INDIAN INSTITUTE OF TECHNOLOGY  
(BANARAS HINDU UNIVERSITY)  
VARANASI-221005  
INDIA

**Roll No. 18051009**

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**Date:**

**Place:** Varanasi

**Dr. Manisha Malviya**

**(Supervisor)**

**Department of Chemistry,  
Indian Institute of Technology  
(Banaras Hindu University),  
Varanasi-221005**

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**Supervisor**

**Dr. Manisha Malviya**  
**Department of Chemistry**  
**Indian Institute of Technology**  
**(Banaras Hindu University)**  
**Varanasi- 221005**

**Co-Supervisor**

**Dr. Sundaram Singh**  
**Department of Chemistry**  
**Indian Institute of Technology**  
**(Banaras Hindu University)**  
**Varanasi- 221005**

**Head of Department**

**Prof. Y. C. Sharma**  
**Department of Chemistry,**  
**Indian Institute of Technology**  
**(Banaras Hindu University),**  
**Varanasi- 221005**

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**Date: 08/12/2023**

**Place: Varanasi**

**(Neetu Verma)**

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## List of Symbols/Abbreviations

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<b><math>\theta</math></b>	Angle (degree)
<b>CV</b>	Cyclic Voltammetry
<b>CP</b>	Chronopotentiometry
<b>EIS</b>	Electron Impedance spectroscopy
<b><math>^{13}\text{C}</math> NMR</b>	Carbon nuclear magnetic resonance
<b>eV</b>	Electron volt
<b><math>C_{dl}</math></b>	Double layer capacitance
<b>HRMS</b>	High Resolution mass spectroscopy
<b><math>\mu\text{F}</math></b>	Microfarad
<b><math>^1\text{H}</math> NMR</b>	Hydrogen nuclear magnetic resonance
<b><math>\mu\text{A}</math></b>	Microampere
<b>TEMPO</b>	(2,2,6,6-Tetramethylpiperidin-1-yl)oxidanyl
<b>J</b>	Coupling constant
<b><math>^{\circ}\text{C}</math></b>	Degree celcius
<b><math>\text{CDCl}_3</math></b>	Deuterated chloroform
<b>s</b>	Second
<b><math>\text{DMSO-d}_6</math></b>	Deuterated Dimethyl sulfoxide
<b>OCP</b>	Open Circuit Potential
<b>GCE</b>	Glassy Carbon Electrode
<b>CA</b>	Chronoamperometry
<b>CPE</b>	Carbon Paste electrode

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## General Experimental Considerations

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All the chemicals were procured from Aldrich, USA, and E. Merck, Germany, and were used as received. The solvents (DMF and DCM) were purchased from Merck and Ranbaxy and were purified before their use. The preparation and particulars of the substrates employed for the work undertaken are given in their respective chapters. Melting Points were measured using Stuart Melting point apparatus SPM10 in open capillary tubes. Electrochemical study were carried out on CHI 680C workstation. The  $^1\text{H}$  (500MHz) and  $^{13}\text{C}$  (126MHz) NMR,  $^{19}\text{F}$  (126 MHz) NMR spectra were run on a Bruker Advance 500 MHz FT-NMR at 500 MHz spectrometers. Chemical shifts are given in  $\delta$  ppm, using tetramethylsilane (TMS) as an internal standard HRMS (m/z) and were recorded in an electron ionization or electrospray ionization (ESI) mode on Waters- Q-TOF Premier- HAB213 and Sciex X500R QTOF instruments. **Purification** standard operating procedures for the specific solvent being purified, as different solvents may require different purification methods drying agents like (molecular sieves), inert gas purging. Additionally, it's essential to use high-purity glassware and equipment to avoid contamination during the purification process. **Thin-layer Chromatography (TLC)** was performed on glass plates ( $7.5 \times 2.5$  and  $7.5 \times 5.0$  cm) coated with Merck silica gel 254 using various combinations of ethyl acetate and n-hexane as an eluent. Visualization of spots was accomplished either in an iodine chamber or by exposure to UV light. Merck silica gel (100-200 mesh) was used for column chromatography (approximately 15-20 g per 1 g of the crude product).