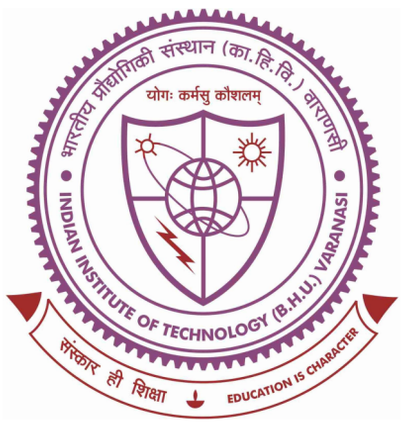
Tuning Charge Transfer Dynamics in Halide Perovskites for Improved Photoredox Organic Reactions



Thesis submitted in partial fulfillment for the Award of Degree

Doctor of Philosophy

By

Vishesh Kumar

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DEDICATED TO MY LOVING PARENTS...

CERTIFICATE

It is certified that the work contained in the thesis titled **"Tuning Charge Transfer Dynamics in Halide Perovskites for Improved Photoredox Organic Reactions"** by **Vishesh Kumar** has been carried out under my supervision, and this work has not been submitted elsewhere for a degree.

It is further certified that the student has fulfilled all the requirements of the Comprehensive Examination, Candidacy, and SOTA for the award of the Ph.D. degree.

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DECLARATION BY THE CANDIDATE

I, **"Vishesh Kumar"**, certify that the work embodied in this thesis is my own bonafide work and carried out by me under the supervision of **"Dr. Arindam Indra"** from **"December 2019"** to **"July-2025,"** at the **Department of Chemistry, Indian Institute of Technology, (BHU), 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 credit to the research workers wherever their works have been cited in my work in this thesis. I further declare that I have not will fully 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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It is certified that the above statement made by the student is correct to the best of my/our knowledge.

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Date: 09/07/2025

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List of Symbols/Abbreviations

θ	Angle (degree)
τ	Trap-state
a.u.	Atomic unit
BE	Binding energy
CBM	Conduction band maxima
^{13}C NMR	Carbon nuclear magnetic resonance
eV	Electron volt
EIS	Electrochemical impedance spectroscopy
EDX	Energy-dispersive X-ray spectroscopy
EPR	Electron spin resonance
Fs-TA	Femtosecond transient spectroscopy
HR-SEM	High Resolution Scanning Electron Microscope
^{1}H NMR	Hydrogen nuclear magnetic resonance
HR-MS	High-resolution mass spectroscopy
mM	Milli-molar
NS	Nanosheet
NHE	Normal hydrogen electrode
PL	Photoluminescence
PXRD	Powder X-ray diffraction
TEM	Transmission Electron Microscopy
XPS	X-ray photoelectron spectroscopy
UV-DRS	Ultraviolet diffused reflectance spectroscopy
UPS	Ultraviolet photoelectron spectroscopy
VBM	Valence band minima
QDs	Quantum dots
λ	Wavelength