

Dedicated to...

My Family Members, Friends, and
Teachers

নিষ্ঠাৰে সমৰ্পিত...

মোৰ পৰিয়ালৰ সদস্যসকল, বন্ধু-বান্ধৱী, আৰু

শিক্ষাগুৰু সকললৈ



Declaration by the Candidate

The thesis titled "*Studies on the Palladium and Copper Catalysed Synthesis of Some Functionalised Carbocycles and Heterocycles*" is submitted to Tezpur University in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Chemical Sciences. This work is a record of genuine research conducted by me under the supervision of Prof. Utpal Bora, Department of Chemical Sciences, Tezpur University. All assistance and contributions from various sources have been duly acknowledged. I further declare that no part of this thesis has been submitted elsewhere for the award of any other degree.

Date: 19.08.2025 .

Place: Tezpur, Assam, India

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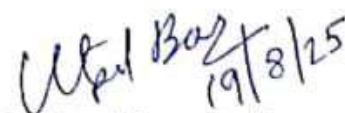
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This is to certify that the thesis titled " *Studies on the Palladium and Copper Catalysed Synthesis of Some Functionalised Carbocycles and Heterocycles*" submitted to the School of Sciences, Tezpur University, in partial fulfilment of the requirements for the award of the Doctor of Philosophy degree in Chemical Sciences, represents the research work conducted by **Mr. Debasish Sarmah** under my supervision and guidance. He has been duly registered (Registration No. **TZ167206 of 2016**), and the thesis presented is considered suitable for the award of the Ph.D. degree. All assistance received from various sources has been properly acknowledged, and no part of this thesis has been submitted elsewhere for the award of any other degree.

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Certificate of the External Examiner and ODEC

This is to certify that the thesis entitled "*Studies on the Palladium and Copper Catalysed Synthesis of Some Functionalised Carbocycles and Heterocycles*", submitted by **Mr. Debasish Sarmah** to the School of Sciences, Tezpur University in partial fulfillment of the requirement for the award of the degree of Doctor of Philosophy in Chemical Sciences, has been examined by us on 19th Aug 2025 and found satisfactory.

The committee recommends for the award of the degree of Doctor of Philosophy.


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Abbreviations and Symbols

Abbreviation/Symbol	Meaning
Δ	Heat
%	Percentage
$^{\circ}\text{C}$	Degree centigrade
δ	Chemical shift
J	Coupling constant
\AA	Angstrom
Ar	Aryl
Ac	Acetyl
$t\text{BuOH}$	Tertiary butyl alcohol
DABCO	1,4-Diazabicyclo[2.2.2]octane
DBU	1,8-Diazabicyclo[5.4.0]undec-7-ene
DMA	Dimethyl acetamide
DMF	Dimethyl formamide
DMSO	Dimethyl sulfoxide
DCE	Dichloroethane
DCM	Dichloromethane
DFT	Density functional theory
EDX	Energy dispersive X-Ray
equiv.	Equivalents
EtOH	Ethyl alcohol
FT-IR	Fourier transform infrared
g	gram
GO	Graphene oxide
h	hour(s)
HOMO	Highest occupied molecular orbital
LUMO	Lowest unoccupied molecular orbital
mmol	milli mole (s)
MHz	Mega-hertz
Me	Methyl
MeOH	Methyl alcohol
m	multiplet

Abbreviations and Symbols

mg	milli gram
MS	molecular sieves
mL	Milli litre
nm	Nano metre (s)
NP	Nanoparticle
NMR	Nuclear magnetic resonance
ppm	parts per million
PEG	Polyethylene glycol
p-XRD	Powder X-ray diffraction
R	Alkyl group
r.d.s.	Rate determining step
SHE	Standard hydrogen electrode
SEM	Scanning electron microscopy
t	triplet
TMS	Tetramethyl silane
TEM	Transmission electron microscopy
UV-Vis	Ultraviolet visible
WEB	Water extract of banana peel ash
XPS	X-ray photoelectron spectroscopy