To My Pillars of Strength…

Maa, Baba & Ramyani

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Declaration of Academic Integrity

I declare that this written submission represents my ideas in my own words and where other's ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all the principles of academic honesty, integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission.

Due acknowledgement to all the related data used from different sources in order to support my research findings have been made wherever necessary. All funding agencies have been duly acknowledged for providing research grants to carry out my research work smoothly.

Prantika Bhattacharjee

Date: 28-11-2023 (**Prantika Bhattacharjee**)

Place: Tezpur University TZ132593 of 2013

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CERTIFICATE FROM SUPERVISOR

This is to certify that the thesis entitled "***Development of Catalytic Strategies for Selective Functionalization of Indoles and Related N-Heterocyclic Compounds***" submitted to the School of Sciences, Tezpur University in partial fulfilment for the award of the degree of Doctor of Philosophy in Chemistry is a record of research work carried out by **Ms. Prantika Bhattacharjee** under my supervision and guidance. She has been duly registered (Registration No. **TZ132593** of **2013**), and the thesis presented is worthy of being considered for the Degree of Doctor of Philosophy.

All help received by her from various sources have been duly acknowledged. No part of this thesis has been submitted elsewhere for award of any other degree.

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CERTIFICATE OF THE EXTERNAL EXAMINER AND ODEC

The examiners of Oral Defense Examination Committee (ODEC) certify that the thesis entitled "***Development of Catalytic Strategies for Selective Functionalization of Indoles and Related N-Heterocyclic Compounds***" submitted by **Ms. Prantika Bhattacharjee** to the School of Sciences, Tezpur University in partial fulfilment for the award of the degree of Doctor of Philosophy in the discipline of Chemical Sciences has been examined on 23-12-2023 and recommended that the degree be awarded.

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List of Schemes

Scheme No.	Scheme Caption	Page No.
Chapter 1		
1.1	Classical methods of synthesis of indole from (a-e) *ortho*-disubstituted arene precursor, and (f-j) monosubstituted precursors	5
1.2	Different modes of transition metal-catalyzed C−H activation	8
1.3	$PdCl_2$ catalyzed C3-cyanation of *N*-substituted indoles	11
1.4	Regio-divergent Pd and Rh catalyzed C3-functionalization of indoles	11
1.5	$Cu(OAc)_2$ catalyzed C3-alkylation of indoles	12
1.6	$FeCl_3$ catalyzed C3-selenylation/sulfenylation of indoles	13
1.7	$B(C_6F_5)_3$ catalyzed C3-methylation of indoles	14
1.8	I_2 catalyzed C3-thioallylation of indoles	14
1.9	PTSA·H_2O-DBU catalyzed C3-alkenylation of indoles	15
1.10	C3-alkylation of *N*-Boc indoles under blue LED	15
1.11	$Pd(Ph_3)_4$ catalyzed C2-arylation of indoles with chloropyrazines	16
1.12	Proposed mechanism for C2- and C3-arylation of indoles	16
1.13	$PdCl_2$ catalyzed C2-acylation of *N*-(2-pyrymidyl)indoles	17
1.14	$[Ru(p\text{-cymene})Cl_2]_2$ catalyzed C2-alkenylation of *N*-benzoylindoles	18
1.15	$RhCl_3·3H_2O$ catalyzed C2-alkoxycarbonylation of *N*-(2-pyrymidyl)indoles	18
1.16	$[Ir(COD)Cl]_2$ catalyzed C2-allylation of 3-substituted indoles	19
1.17	$Ni(OAc)_2$ catalyzed C2-arylation of *N*-(2-pyridyl)indoles	19
1.18	$Pd(MeCN)_4(BF_4)_2$ catalyzed C2-alkynylation of *N*-methylindoles	20

1.19	$Pd(OAc)_2$ catalyzed C2-perfluoroalkylation of free (*N*−H) indoles	21
1.20	$PdCl_2(MeCN)_2$ catalyzed C2-arylation of free (*N*−H) indoles	21
1.21	$[RuCl_2(p\text{-cymene})]_2$ catalyzed C2-alkylation of free (*N*−H) indoles	22
1.22	Benzoic acid promoted C2-borylation of *N*-methylindoles	22
1.23	Pd-SPhos catalyzed Suzuki-Miyaura coupling reaction of *N*-heterocyclic halides with heteroarylboronic acids	23
1.24	Mechanism of Suzuki-Miyaura coupling reaction of *N*-rich heterocyclic substrates	24
1.25	Pd-PEPPSI catalyzed Suzuki-Miyaura cross-coupling reaction of *N*-heterocycles	25

Chapter 2

2.1	Previous and present study on C3-benzylation of 1-methylindole	38
2.2	Plausible mechanism for C3-benzylation of indoles	43

Chapter 3

3.1	(a) Representative compounds having core of cyclopenta[*b*]indole, (b) synthesis of cyclopenta[*b*]indoles from indoles and acetone	59
3.2	Control experiments for investigations on reaction pathway	64
3.3	Plausible mechanism for I_2 catalyzed reaction between indole and acetone	65

Chapter 4

Section A

4A.1	Previous and present study on direct C−H arylation of indoles	86
4A.2	Plausible mechanism for C2-arylation of indoles	93

Section B

4B.1	Sequential one-pot double functionalization of indoles	116

4B.2 Plausible mechanism for C2-arylation of indoles with arylboronic acids 120

Chapter 5

5.1 Plausible mechanism for SMCR catalyzed by Pd-Ag@PMFC 159

Chapter 6

6.1 Future scope of (a) 2-arylated indoles, and (b) 2,5-diarylated pyrroles 179

List of Figures

Figure No.	Figure Caption	Page No.
Chapter 1		
1.1	Representative examples of parent *N*-heterocyclic compounds	2
1. 2	Indole-based heterocyclic compounds with biological significance	4
1.3	C–H bond activation and functionalization	7
1.4	Structure of indole motif	9
1.5	Scope of the literature review of the thesis	10
1.6	Directing group mode of action	17
1.7	Sustainable organic synthesis	26
Chapter 2		
2.1	Proposed mode of activation for iodine catalysis	42
2.2	ORTEP of **3a** with 50% probability ellipsoids	52
2.3	HRMS spectrum of **3t**	52
2.4	^{1}H NMR (400 MHz) spectrum of **3a** in $CDCl_3$	53
2.5	$^{13}C\{^{1}H\}$ NMR (100 MHz) spectrum of **3a** in $CDCl_3$	53
2.6	^{1}H NMR (400 MHz) spectrum of **3m** in $CDCl_3$	54
2.7	$^{13}C\{^{1}H\}$ NMR (100 MHz) spectrum of **3m** in $CDCl_3$	54
Chapter 3		
3.1	ORTEP of **2d** with 50% probability ellipsoids	78
3.2	HRMS spectrum of **2c**	78
3.3	^{1}H NMR (400 MHz) spectrum of **2a** in $CDCl_3$	79
3.4	$^{13}C\{^{1}H\}$ NMR (100 MHz) spectrum of **2a** in $CDCl_3$	79
3.5	^{1}H NMR (400 MHz) spectrum of **3a** in $CDCl_3$	80
3.6	$^{13}C\{^{1}H\}$ NMR (100 MHz) spectrum of **3a** in $CDCl_3$	80
3.7	^{1}H NMR (400 MHz) spectrum of **3a´** in $CDCl_3$	81
3.8	$^{13}C\{^{1}H\}$ NMR (100 MHz) spectrum of **3a´** in $CDCl_3$	81

Chapter 4

Section A

4A.1	Reusability of Pd/C over four cycles	91
4A.2	(a) Survey scans XPS spectrum of the reused catalyst, and corresponding high resolution deconvoluted XPS spectra of (b) Pd 3d, (c) Ag 3d, and (d) C 1s	92
4A.3	^{1}H NMR (400 MHz) spectrum of **3aa** in $CDCl_3$	101
4A.4	$^{13}C\{^{1}H\}$ NMR (100 MHz) spectrum of **3aa** in $CDCl_3$	101
4A.5	^{1}H NMR (400 MHz) spectrum of **3aj** in $CDCl_3$	102
4A.6	$^{13}C\{^{1}H\}$ NMR (100 MHz) spectrum of **3aj** in $CDCl_3$	102

Section B

4B.1	SEM micrographs of (a-b) LCpp, (c-e) Pd NPs@LCpp, and corresponding (f-h) EDX elemental mapping images	106
4B.2	(a-c) TEM images, (d) particle size distribution histogram, (e) HRTEM image, (f) SAED pattern, and (g) EDX image, of Pd NPs@LCpp	107
4B.3	(a) Survey scans XPS spectrum of Pd NPs@LCpp, and corresponding high-resolution XPS spectra of (b) Pd 3d, (c) C 1s, and (d) O 1s	108
4B.4	(a) Powder XRD patterns, (b) FT-IR spectra, of LCpp and Pd NPs@LCpp	109
4B.5	N_2 adsorption/desorption isotherms of (a) LCpp, (b) Pd NPs@LCpp, and inset in (a, b) shows the BJH pore size distribution curves	110
4B.6	Reusability test for Pd NPs@LCpp	117
4B.7	High-resolution XPS spectra of (a) Pd 3d, and (b) Ag 3d, (c-d) TEM images of the recycled Pd NPs@LCpp catalyst	118
4B.8	Schematic preparation method of Pd NPs@LCpp from waste pomegranate peels	122
4B.9	^{1}H NMR (400 MHz) spectrum of **3bp** in $CDCl_3$	130
4B.10	$^{13}C\{^{1}H\}$ NMR (100 MHz) spectrum of **3bp** in $CDCl_3$	130
4B.11	^{1}H NMR (400 MHz) spectrum of **4a** in $CDCl_3$	131

4B.12 $^{13}C\{^{1}H\}$ NMR (100 MHz) spectrum of **4a** in $CDCl_3$ 131

Chapter 5

5.1 Previous and present approaches for extraction of cellulose fibers from plant biomass 140

5.2 (a, b) SEM images, (c-f) TEM images, (g) HRTEM image, (h) SAED pattern, and (i) particle size distribution histogram, of Pd-Ag@PMFC 142

5.3 EDX spectrum of Pd-Ag@PMFC 143

5.4 (a) Electron image, and corresponding (b-d) EDX elemental mapping images, of Pd-Ag@PMFC 144

5.5 (a) Powder XRD patterns, (b) FT-IR spectra, of PMFC and Pd-Ag@PMFC 145

5.6 TGA curves of PMFC and Pd-Ag@PMFC 146

5.7 N_2 adsorption/desorption isotherms of (a) PMFC, (b) Pd-Ag@PMFC, and inset in (a, b) shows the BJH pore size distribution curves 146

5.8 (a) Survey scans XPS spectrum of Pd-Ag@PMFC, and corresponding high-resolution deconvoluted XPS spectra of (b) Pd 3d, (c) Ag 3d, and (d) C 1s 147

5.9 Reusability test for Pd-Ag@PMFC 154

5.10 (a-d) TEM images, (e) HRTEM image, and (f) SAED pattern, of the recovered Pd-Ag@PMFC catalyst 155

5.11 Deconvoluted high-resolution XPS spectra of (a) Pd 3d, (b) Ag 3d, of the recovered Pd-Ag@PMFC catalyst 156

5.12 UV-vis spectrum of Pd-Ag@PMFC [0.01 g dispersed in H_2O-EtOH 1:1 (10 mL)] 158

5.13 Schematic preparation method of Pd-Ag@PMFC from waste pomegranate peels 162

5.14 ^{1}H NMR (400 MHz) spectrum of **3k** in $CDCl_3$ 169

5.15 $^{13}C\{^{1}H\}$ NMR (100 MHz) spectrum of **3k** in $CDCl_3$ 169

5.16 ^{1}H NMR (400 MHz) spectrum of **3k** in $CDCl_3$ 170

5.17 $^{13}C\{^{1}H\}$ NMR (100 MHz) spectrum of **3k** in $CDCl_3$ 170

Chapter 6

6.1	Schematic outline of experimental chapters	177
6.2	C–H functionalization at C4-C7 positions of indole	180
6.3	Heterogeneous photocatalytic C–H activation process	180

List of Tables

Table No.	Table Title	Page No.
Chapter 2		
2.1	Screening of the effect of catalysts and solvents	39
2.2	Substrate scope for C3-benzylation of indoles with benzyl alcohols	41
2.3	Comparative study of I_2 and HI mode of catalysis	42
2.4	Crystallographic parameters of structures **3a**	51
Chapter 3		
3.1	Optimization of reaction conditions for synthesis of **2a**	60
3.2	Substrate scope for indolyl-cyclopenta[*b*]indole derivatives	62
3.3	Substrate scope for bis(indolyl)alkane derivatives	63
3.4	Crystallographic parameters of structures **2d**	77
Chapter 4		
Section A		
4A.1	Screening of reaction conditions for C2-arylation of indoles	87
4A.2	Substrate scope for C2-arylation of indoles with arylboronic acids	89
Section B		
4B.1	Pd-based heterogeneous catalysts explored for C2-arylation of indoles	104
4B.2	Screening of reaction conditions for C2-arylation of indoles	111
4B.3	Substrate scope for C2-arylation of indoles with arylboronic acids	114
Chapter 5		
5.1	Screening of reaction conditions for SMCR	148
5.2	SMCR of *N*-heteroaryl bromides and arylboronic acids	150
5.3	SMCR of aryl bromides and *N*-heteroarylboronic acids	152

5.4 SMCR of *N*-heteroaryl bromides and *N*-heteroarylboronic acids 153

5.5 Comparative study of different metal combinations 157

5.6 Comparison between Pd-Ag@PMFC catalyst and the previously reported methods in SMCR of heteroaromatic system 160

Abbreviations and Symbols

%	Percentage
δ	Chemical shift
J	Coupling constant
λ	Wavelength
ν	Wavenumber
°	Degree
θ	Diffraction angle
Φ	Work function
Å	Angstrom
Ac	Acetyl
AgTFA	Silver trifluoroacetate
Anal.	Analytical
Ar	Aryl
a.u.	Arbitrary unit
BET	Brunauer-Emmett-Teller
BJH	Barrett-Joyner-Halenda
Bn	Benzyl
Boc	*tert*-Butyloxycarbonyl group
br	Broad
°C	Degree Celsius
CAE	Constant analyzer energy
CCDC	Cambridge Crystallographic Data Centre
$CDCl_3$	Deuterated chloroform
cm	centimeter
COD	Cyclooctadiene
CSA	Camphorsulfonic acid
d	Doublet
DBU	1,8-Diazabicyclo[5.4.0]undec-7-ene
D_{cal}	Calculated density
DCE	1,2-Dichlorethane
DCM	Dichloromethane

dd	Doublet of doublet
DG	Directing group
DMA	Dimethylacetamide
DMF	*N*,*N*-dimethylformamide
DMSO	Dimethylsulfoxide
DMSO-d_6	Deuterated dimethylsulfoxide
dppm	1,1'-Bis(diphenylphosphino)methane
dppf	1,1'-Bis(diphenylphosphino)ferrocene
dq	Doublet of quartets
dt	Doublet of triplets
DTBM	3,5-Di-*tert*-butyl-4-methoxyphenyl
EDG	Electron donating group
EDX	Energy dispersive X-ray
equiv	Equivalent
ESI/Q-TOF	Electrospray-ionization quadrupole time-of-flight
Et	Ethyl
EtOH	Ethanol
eV	Electron volt
EWG	Electron withdrawing group
fcc	Face-centred cubic unit cell
FT-IR	Fourier-transformed infra-red spectroscopy
g	Gram
h	Hour
HOMO	Highest occupied molecular orbital
HRMS	High resolution mass spectrometry
HRTEM	High resolution transmission electron microscope
ICP-OES	Inductively coupled plasma optical emission spectrometry
i-PrOH	Isopropanol
JCPDS	Joint Committee on Powder Diffraction Standards
K	Kelvin
kV	Kilovolt
LCpp	Lignocellulose derived from pomegranate peel

LiHMDS	Lithium hexamethyldisilazide
LSPR	Localized surface plasmon resonance
LUMO	Lowest unoccupied molecular orbital
m	Multiplet
m^2	Square meter
Me	Methyl
MeOH	Methanol
mg	Milligram
MHz	Megahertz
min	Minute
mL	Millilitre
mM	Millimolar
mmol	Millimole
mol%	Mole percentage
mp	Melting point
MS	Molecular sieves
m/z	Atomic mass units per charge
n-Bu	Normal-butyl
NC	Nanoclusters
nd	Not detected
nm	Nanometre
NMR	Nuclear magnetic resonance spectroscopy
NP	Nanoparticle
nr	No reaction
Nu	Nucleophile
ORTEP	Oak Ridge Thermal Ellipsoid Plot
P_0	Saturated pressure of adsorbate gas (in Pascals)
PEG	Polyethylene glycol
PEPPSI	Pyridine-enhanced precatalyst preparation stabilization and initiation
Ph	Phenyl
PMFC	Pomegranate-peel derived micro-fibers of cellulose
ppm	Parts per million

PTSA	*Para*-toluenesulfonic acid
PXRD	Powder X-ray diffraction analysis
q	Quartet
rpm	Revolutions per minute
rt	Room temperature
s	Singlet
SAED	Selected area electron diffraction
SEGPHOS	5,5′-Bis(diphenylphosphino)-4,4′-bi-1,3-benzodioxole
SEM	Scanning electron microscope
SMCR	Suzuki-Miyaura cross-coupling reaction
SPhos	Dicyclohexyl(2′,6′-dimethoxy[1,1′-biphenyl]-2-yl)phosphane
t	Triplet
T	Temperature
TBHP	*tert*-Butyl hydroperoxide
t-Bu	*tert*-Butyl
t-BuOH	*tert*-Butanol
td	Triplet of doublets
TEM	Transmission electron microscope
Tf	Triflate
TGA	Thermogravimetric analysis
THF	Tetrahydrofuran
TLC	Thin layer chromatography
TMS	Tetramethylsilane
TPPMS	Monosulfonated triphenylphosphane
UV-Vis	Ultraviolet-visible
v/v	Volume/volume
W	Watt
wt%	Weight percentage
XPS	X-ray photoelectron spectroscopy
Z	Number of atoms present per unit cell