

## List of figures:

Chapter	Figure	Title	Page no
2(Introduction)	1	Mechanism of Suzuki-Miyaura cross-coupling reaction	3
	2	Phospane-Pd complex and phosphane ligands for Suzuki-Miyaura reaction	5
	3	(NHC)Pd complex and NHC ligands used in Suzuki-Miyaura reaction	5
	4	<i>N</i> -containing ligands developed for Suzuki-Miyaura cross-coupling reaction	6
	5	Mechanism of Sonogashira coupling reaction	9
	6	Deprotonation mechanism for Cu free Sonogashira reaction	11
	7	Carbopalladation mechanism for Cu free Sonogashira reaction	11
	8	Phosphine based ligands for Cu co-catalyzed Sonogashira reaction	13
	9	Phosphine based ligands in Sonogashira reaction	14
	10	Phosphine based ligands used in copper free Sonogashira reaction	15
	11	NHCs used in Sonogashira reaction	16
	12	Palladacycle used in Sonogashira reaction	17
2(Section 2.1)	1	Preparation of 'WERSA' and our development	25
	2	EDX spectrum of rice straw ash	25
	3	IC analysis of rice straw ash	26
	4	TEM images of Pd NPs and Pd NPs distributions	28
	5	X-ray diffraction pattern of Pd NPs	29
2(Section 2.2)	1	(a) N <sub>2</sub> adsorption–desorption isotherm and (b) pore size distribution curve of the catalyst	41
	2	EDX and SEM analysis spectra of the catalyst	41
	3	(a) SAED pattern of PdNPs, (b-e) TEM images along with particle size distribution, (f) HRTEM image along with fringe spacing	42
	4	Powder XRD pattern of the catalyst and the parent clay	43
	5	Activation of the boronic acid moiety by the hydroxyl groups of montmorillonite	44
	6	Mechanistic route for the reaction over the heterogeneous catalyst	47
	7	Reusability plot of the catalyst	47

	8	TEM images (i-iv) of the recovered catalyst after 4 <sup>th</sup> cycle	48
	9	PXRD pattern of the recovered catalyst after 4 <sup>th</sup> cycle	49
	10	Hot filtration test	49
2(Section 2.3)	1	Reusability of the catalyst	61
	2	PXRD pattern of (A) fresh catalyst, (B) after 2 <sup>nd</sup> cycle and (C) after 5 <sup>th</sup> cycle	62
	3	TEM images of the catalyst after (a-d) 2 <sup>nd</sup> cycle and (e-f) after 5 <sup>th</sup> cycle	62
	4	Hot filtration test for the catalyst	63
3(Introduction)	1	Fields of applications of C-N bond formation reaction	1
	2	C-N bond containing some organic compounds	2
	3	Proposed mechanism for Buchwald-Hartwig amination	4
	4	<i>N</i> -containing ligands in Cu-catalyzed <i>N</i> -arylation reaction	7
	5	<i>N</i> -containing ligands in Cu catalyzed <i>N</i> -arylation reaction	7
	6	<i>O</i> -donor ligands for <i>N</i> -arylation	8
	7	Both <i>O</i> - and <i>N</i> -donor ligands for <i>N</i> -arylation	8
	8	Different organometallic coupling partners for <i>N</i> -arylation	9
	9	Proposed mechanism for Chan-Lam cross-coupling reaction	11
	10	Pathways to synthesize nitroarenes using nitrate salts	14
3(Section 3.1)	1	(a) <i>Musa balbisiana</i> Colla fruits, (b) Burnt ash and (c) 'WEBPA'	26
	2	EDX image of the banana peel ash	27
	3	IC curve of banana peel extract	27
3(Section 3.2)	1	Plausible reaction mechanism	48
	2	Optimized structures of different species involved in both the steps	49
	3	IRC plots of transition states of (a) 1 <sup>st</sup> step and (b) 2 <sup>nd</sup> step	50
	4	Potential energy diagram of 1 <sup>st</sup> step (black line) and 2 <sup>nd</sup> step (red line)	51
	5	Schematic diagram of the reaction mechanism	52
4(Introduction)	1	<i>Ipso</i> -hydroxylation of arylboronic acid to phenol	4
	2	<i>Ipso</i> -hydroxylation of arylboronic acid to phenol	5
4(Section 4.1)	1	Proposed mechanistic pathway for the synthesis of phenol	14
4(Section 4.2)	1	Proposed mechanism of the reaction	28