Table of Contents

1 A	Aryl Germanes in Gold Catalyzed Oxidative Coupling Reactions	3
1.1	Introduction	4
1.2	Results and Discussion	
1	1.2.1 Bond Activation of Arvl Germanes with Gold Complexes	
1	1.2.2 C–H Functionalization of Electron-Rich Arenes	
1	1.2.3 Reactivity Limitations for C–H Functionalization	
1	1.2.4 C–H Functionalization of Electron Deficient Arenes	
1	1.2.5 C _{sp2} –C _{sp2} Cross Coupling of Aryl Germanes with Aryl Diazonium Salts	20
1.3	Conclusion	
2 4	Aryl Germanes in Cross Coupling Reactions with Palladium Nanoparticles	
2.1	Introduction	
2	2.1.1 Nanoparticles in Chemical Transformations	24
2	2.1.2 Potential of Nanoparticles in Cross Coupling Reactions	26
2.2	Results and Discussion	
2	2.2.1 Stoichiometric Reactivity of Aryl Germanes with Pd ⁽¹¹⁾	
2	2.2.2 Stoichiometric Reactivity of [Pd] Nanoparticles	
2	2.2.3 Development of a Catalytic C–C Bond Forming Reaction	
2.3	Conclusion	
3 N	Metal-free <i>ipso</i> -Halogenation of Aryl Germanes	39
3.1	Introduction	40
3.2	Results and Discussion	
3	3.2.1 Development of Halogenation with ArGeEt3	43
3	3.2.2 Mechanistic Investigation	45
3	3.2.3 Selective Halogenation of Aryl Germanes	47
3	8.2.4 Radiolabeling	49
3.3	Conclusion	
4 E	Experimental Section	
4.1	General Experimental Details	
4	.1.1 Reagents and Solvents	
4	.1.2 Experimental Techniques	54
4	.1.3 Flow Set-Up	55

4.1.4	Quantitative Analysis	
4.2	Synthesis of Aryl Germanes	56
4.2.1	Characterization Data	
4.3	Aryl Germanes in Gold Catalyzed Oxidative Coupling Reactions	63
4.3.1	Mechanistic Investigation	
4.3.2	C–H Functionalization of Electron Rich Arenes	
4.3.3	Competition Experiments	
4.3.4	C–H Functionalization with Flow Set-Up	
4.3.5	5 Stoichiometric Reactivity for Ar-H Activation by Gold(I)	
4.3.6	6 Reaction of Aryl Germanes with Diazonium salts	
4.4	Aryl Germanes in Cross Coupling Reactions with Palladium Nanoparticles	
4.4.1	1 Cross Coupling Reactions	
4.4.2	2 Characterization Data	
4.4.3	3 Intramolecular Competition	
4.4.4	4 Mechanistic Investigations	
4.4.	5 TEM Analysis	
4.4.	6 Pd ⁽⁰⁾ /Pd ⁽¹¹⁾ Molecular Catalysis <i>versus</i> Nanoparticle Catalysis	101
4.5	Metal-free ipso-Halogenation of Aryl Germanes	
4.5.	1 Characterization Data for Bromination of Aryl Germanes	105
4.5.	2 Characterization Data for Iodination of Aryl Germanes	110
4.5.	3 Competition with Aryl Silanes and Aryl Boronic Ester Derivatives	115
4.5.	4 Halogenation of Substrate for Radiolabeling	118
4.5.	5 Mechanistic Investigation	120
4.5	6 Computational Details	129
5 Lite	erature	145