

## Table of Contents

<b>Danksagung</b> .....	<b>I</b>
<b>Table of Contents</b> .....	<b>III</b>
<b>List of Abbreviations</b> .....	<b>VII</b>
<b>Motivation</b> .....	<b>XI</b>
<b>Zusammenfassung</b> .....	<b>XIII</b>
<b>Abstract</b> .....	<b>XIX</b>
<b>1 Theoretical Survey</b> .....	<b>1</b>
1.1 Carbenes .....	1
1.1.1 N-Heterocyclic Carbenes .....	2
1.1.2 Fischer and Schrock Carbene Complexes .....	8
1.2 Olefin Metathesis .....	10
1.2.1 Scope .....	11
1.3 Initiators for Olefin Metathesis .....	13
1.3.1 Development of Well-Defined Group VI Olefin Metathesis Catalysts .....	13
1.3.2 Schrock Catalysts .....	21
1.3.3 Grubbs Catalysts .....	29
1.3.4 Molybdenum- and Tungsten Imido Alkylidene NHC-Complexes .....	38
1.3.5 Stereoselective Ring-Opening Metathesis Polymerization .....	41
<b>2 Results and Discussion</b> .....	<b>49</b>
2.1 Synthesis of <i>Trans</i> -Isotactic Poly(Norbornene) Derivatives .....	49
2.1.1 Introduction .....	49
2.1.2 Results and Discussion .....	50
2.1.3 Conclusion and Outlook .....	69

2.2	Synthesis and Reactivity of Air-Stable Cationic Molybdenum and Tungsten Imido Alkylidene NHC Complexes .....	71
2.2.1	Introduction.....	71
2.2.2	Results and Discussion .....	72
2.2.3	Conclusion and Outlook.....	95
2.3	Synthesis and Reactivity of Cationic Molybdenum Oxo Alkylidene NHC Complexes.....	97
2.3.1	Introduction.....	97
2.3.2	Results and Discussion .....	98
2.3.3	Conclusion and Outlook.....	107
2.4	Preparation of and Fiber Production from Fully Hydrogenated, Syndiotactic Poly(Dicyclopentadiene) through Ring-Opening Metathesis Polymerization .....	109
2.4.1	Introduction.....	109
2.4.2	Results and Discussion .....	109
2.4.3	Conclusion and Outlook.....	118
<b>3</b>	<b>Experimental.....</b>	<b>119</b>
3.1	General.....	119
3.1.1	Methods.....	119
3.1.2	Solvents and Chemicals .....	119
3.2	Equipment and Analytics .....	119
3.2.1	NMR .....	119
3.2.2	GC-MS.....	120
3.2.3	SEC.....	120
3.2.4	Elemental Analysis.....	120
3.2.5	Single-Crystal X-Ray Analysis .....	120
3.2.6	Differential Scanning Calorimetry.....	120

---

3.2.7	Tensile Testing .....	120
3.2.8	Rheology Measurements.....	121
3.2.9	Melt Spinning .....	121
3.3	Chemicals Synthesized According to Literature Procedures .....	121
3.4	Synthesis of <i>Trans</i> -Isotactic Poly(Norbornene) Derivatives .....	122
3.5	Synthesis and Reactivity of Air-Stable Cationic Molybdenum and Tungsten Imido Alkylidene NHC Complexes .....	133
3.6	Synthesis and Reactivity of Cationic Molybdenum Oxo Alkylidene NHC Complexes .....	165
3.7	Preparation of and Fiber Production from Fully Hydrogenated, Syndiotactic Poly(Dicyclopentadiene) through Ring-Opening Metathesis Polymerization .....	169
<b>4</b>	<b>References .....</b>	<b>171</b>
<b>5</b>	<b>Appendix.....</b>	<b>183</b>
5.1	NMR Spectra .....	183
5.1.1	Synthesis of <i>Trans</i> -Isotactic Poly(Norbornene) Derivatives ....	183
5.1.2	Synthesis and Reactivity of Air-Stable Cationic Molybdenum and Tungsten Imido Alkylidene NHC Complexes.....	195
5.1.3	Synthesis and Reactivity of Cationic Molybdenum Oxo Alkylidene NHC Complexes.....	199
5.2	Single Crystal X-Ray Diffraction .....	207
<b>6</b>	<b>Curriculum Vitae .....</b>	<b>273</b>