

Table of Contents

Danksagung	I
Table of Contents	III
List of Abbreviations.....	VII
Motivation	XI
Zusammenfassung.....	XIII
Abstract	XIX
1 Theoretical Survey	1
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
2 Results and Discussion.....	49
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
3	Experimental.....	119
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
4	References	171
5	Appendix.....	183
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
6	Curriculum Vitae	273