

Contents

1	Introduction	1
2	General Part	4
2.1	Influence of the chirality on the behavior of the compounds	4
2.2	Enantiomerically pure compounds	7
2.3	Catalysis	7
2.3.1	Homogeneous vs. heterogenous catalysis	8
2.4	Asymmetric reduction	11
2.4.1	Enantioselective hydrogenation	12
2.4.2	Mechanism of the asymmetric hydrogenation	15
2.4.3	Asymmetric homogeneous hydrogenation using metal-catalyst in industrial application	18
2.4.4	Chiral Cl-MeO-Biphep ligand	21
2.5	Palladium catalyzed C-N bond-forming process	23
2.5.1	General Buchwald-Hartwig amination reaction ^[61]	23
2.5.2	Proposed Mechanism of the amination reaction	25
2.5.3	Dave-Phos and X-Phos ligands applied in C-N formation	27
2.6	Biphasic systems for reuse and recycling of the catalyst complexes	29
2.6.1	Immobilization by aqueous catalysts	29
2.6.2	Immobilization by nonaqueous biphasic systems	33
2.6.3	Immobilization and fixation to supported organic and inorganic polymers or matrices	35
3	Results and Discussion	39
3.1	Aims and Scopes	39
3.2	Asymmetric hydrogenation with different conditions and solvents using Cl-MeO-Biphep and BINAP ligands	40
3.2.1	Comparison of the two biaryl type phosphine ligands 3 and 11	40
3.2.2	Use of different solvents for the reduction of 1	42
3.2.3	Applying IL as a medium for the enantioselective hydrogenation of 1	44

3.2.4	Investigation of σ -ability of Cl-MeO-Biphep (3).....	46
3.2.5	Scale up reaction for asymmetric hydrogenation in the research laboratory of Lanxess FC.....	47
3.2.6	Further improvement of asymmetric hydrogenation for the industrial applications with the view of costs.....	48
3.3	Derivatization of Cl-MeO-Biphep ligand (3).....	49
3.4	Optimization of the recycling procedure of Cl-MeO-Biphep ligand via oxide derivative 3a and its scale up	51
3.4.1	Designing a separation and recycling cycle to demonstrate the steps of the complete procedure.....	51
3.4.2	Optimization of the reduction step using the standard oxide 3a	54
3.4.3	Optimization of the recovery cycle.....	56
3.4.4	Modeling of the recycling procedure as an industrial process.....	58
3.5	Results of Buchwald-Hartwig amination and the recycling process applying Dave-Phos and X-Phos ligands.....	60
4	Summary and Outlook.....	66
4.1	Summary.....	66
4.2	Outlook.....	70
5	Experimental Part	72
5.1	General Technique.....	72
5.2	Characterisation and use of ligand 3 in asymmetric hydrogenation.....	74
5.3	Derivatization of ligand 3	81
5.4	Optimization of the recycling cycle for ligand 3	84
5.5	Amination reaction using Dave-Phos (7) and X-Phos (8) ligand.....	98
6	Spectra.....	111
7	Literature	116