

## ABSTRACT

### RUTHENIUM(II)-CATALYZED ASYMMETRIC TRANSFER HYDROGENATION OF AROMATIC KETONES USING NEW FERROCENE-BASED AMINO-PHOSPHINE LIGANDS FEATURING PLANAR CHIRALITY

The goals of this research project were as follows: (1) to prepare a series of new chiral ferrocenyl-aminophosphine ligands and their corresponding Ru(II) complexes; (2) to investigate their potential as pre-catalysts for the ATH reaction of acetophenone and two of its derivatives, 4-fluorophenyl (4-F) and 3-methoxyphenyl (3-OCH<sub>3</sub>). Through a six-step procedure, ferrocenyl aldehyde **1** synthesized starting with the commercially available ferrocene carboxyaldehyde **16**. Compound **1** was then allowed to react with each member of a series of chiral primary mono- and diamines (**25-28**) to produce the previously unreported imino-phosphines **7** and **29-31**. The reduction of each of the imino-phosphine compounds with LiAlH<sub>4</sub> (in THF) gave the corresponding amino-phosphine ligands (**2-6**). All compounds were characterized by NMR and IR spectroscopy. The Ru(II) complexes were obtained by reacting each ligand (**2-6**) with one of the three Ru-containing starting materials [(C<sub>6</sub>H<sub>6</sub>)RuCl<sub>2</sub>]<sub>2</sub>, (DMSO)<sub>4</sub>RuCl<sub>2</sub>, and (Ph<sub>3</sub>P)<sub>3</sub>RuCl<sub>2</sub>, in THF. An early screening of these complexes showed that pre-catalysts obtained from (Ph<sub>3</sub>P)<sub>3</sub>RuCl<sub>2</sub> and ferrocenyl amino-phosphines were the most active in the ATH reaction of acetophenone and its 4-F and 3-OCH<sub>3</sub> derivatives. Additionally, it was found that the 4-F derivative gave the highest enantio-selectivity (44% ee) and conversion rate (70%) with such pre-catalysts.

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