Catalytic Hydroamination with Tantalum Pentakisdimethylamide Complexes of Chiral Amino Alcohols

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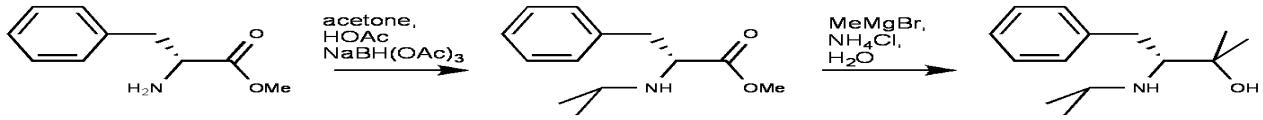
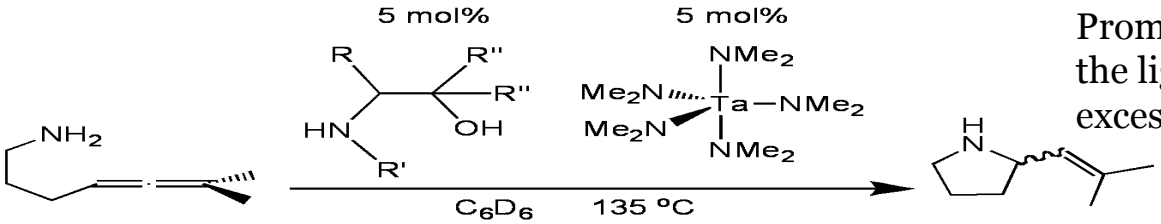
Background: Early transition metals have proven to be effective catalysts for hydroamination of various compounds. Cyclic amines can be synthesized from this reaction and are one of the common starting materials in the pharmaceutical industry. This research project's aim was to study the catalytic effect of tantalum derived compounds on the hydroamination of aminoallenes. Our goal was to increase the enantioselectivity of the reaction while still achieving high percent conversions.

Current Work: Synthesis of 11 ligands according to the general scheme below has been carried out.



These ligands, along with 10 pre-existing ligands are being tested with Ta(NMe2)5 on the hydroamination of 6-methyl-hepta-4,5-dienylamine following the scheme shown below.



R = L-phenylananine or L-valine
R' = adamantyl, isopropyl, or cyclohexyl groups
R" = H, methyl, butyl or phenyl groups

Promising results have been obtained from 4 of the ligands tested, resulting in enantiomeric excesses of between 30-74%.

Compared to previous work with titanium, which gave %ee's around 16, tantalum has proven to be a faster, more enantioselective catalyst.

Future Work: Synthesis and testing of capped tantalum, tethered capped tantalum, and niobium pre-catalysts along with formation of crystal structures to confirm catalyst structures will be carried out in the future.