國立臺灣師範大學化學系碩士論文

指導教授：吳學亮 博士

銠金屬(I)/掌性雙烯配體催化芳基硼酸至 4-酮基丁烯醯胺化合物行不對稱 1,4 加成反應

Highly Enantioselective 1,4-Addition Reaction of Arylboronic Acids to 4-Oxobutenamides Catalyzed by Rh(I)/Chiral Diene Complexes

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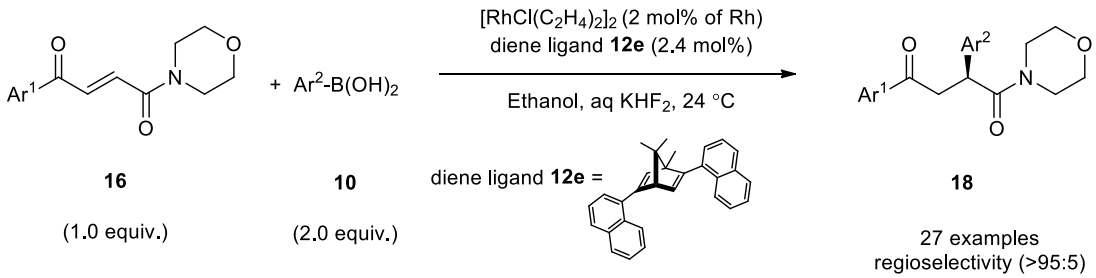
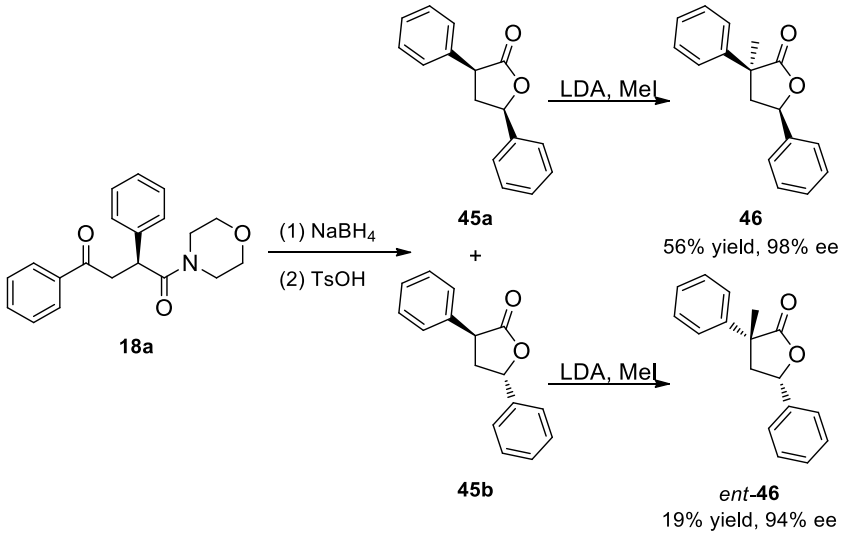
中文摘要：

本論文敘述以 2 莫耳百分比的一價銠金屬 (Rh) 與掌性雙烯配位基(chiral- diene ligand) 所形成的金屬錯合物，在最佳化條件下(24 ℃，乙醇為溶劑，$KHF_{2(aq)}$為添加劑)，催化芳基硼酸進行不對稱 1,4-加成反應至(*E*)-1-嗎啉基-4-芳基丁烯-1,4-二酮 (**16a**)。可得一系列具有掌性中心的 2-芳基-4-酮基丁醯胺產物，其產率最高可至 99%，鏡像超越值最高也可達 99.5%。

在合成應用上，以加成產物 **18a** 作為起始物合成出 α 位置上為掌性四級碳中心的內酯 **46**。此反應過程經由以 $NaBH_4$ 進行還原反應；2) 酸性條件下環化成內酯，得其非鏡像異構物比例為 2 比 1 的一對非鏡像異構物 **45a** 及 **45b**；3) 烷化步驟中合成出具有掌性四級碳中心的內酯 **46** 及其鏡像異構物 *ent*-**46**。

關鍵字: 掌性銠金屬催化試劑, 掌性四級碳中心, 2-芳基-4-酮基丁醯胺


[RhCl(C2H4)2]2 (2 mol% of Rh)
diene ligand 12e (2.4 mol%)
Ethanol, aq KHF2, 24 °C
+ Ar2-B(OH)2
16
(1.0 equiv.)
10
(2.0 equiv.)
diene ligand 12e =
18
27 examples
regioselectivity (>95:5)
78 to >99% yield
93 to >99.5% ee

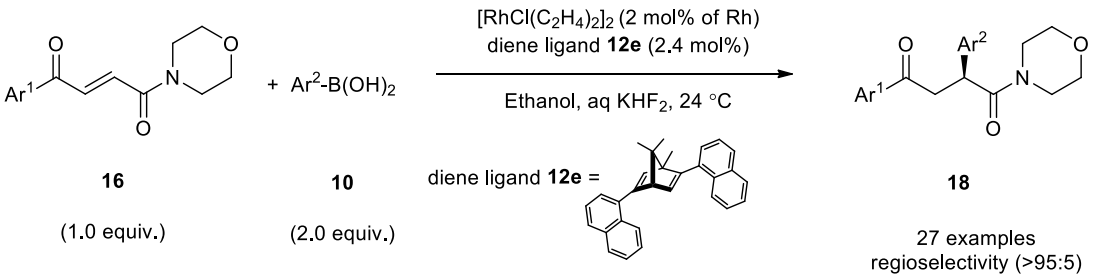

(1) NaBH4
(2) TsOH
18a
45a
45b
LDA, MeI
LDA, MeI
46
56% yield, 98% ee
ent-46
19% yield, 94% ee

English Abstract:

This thesis describes the preparation of chiral 2,4-diaryl-4-oxobutanamindes from asymmetric conjugate addition reaction of various arylboronic acids to (*E*)-1-morpholino-4-arylbut-2-ene-1,4-dione **16**. In the presence of 2 mol% of chiral rhodium catalyst comprising of $[RhCl(C_2H_4)_2]_2$ and chiral diene ligand **12e**, the catalytic reaction proceeds in a high diastereoselective fashion to provide the corresponding adducts **18** with a C2-stereogenic center in up to 99% yield and >99.5% ee in EtOH using $KHF_{2(aq)}$ as an additive.

In the synthetic application, compound **18a** was transformed into enantiomeric isomers bearing a quaternary chiral center at the α–position of lactone compound **46**. The sequence of the transformation involves 1) reduction of compound **18a** with $NaBH_4$; 2) the resulting diastereomeric isomers, with an approximate ratio of 2:1, were subjected to acid-catalyzed translactonization to yield **45a** and **45b**, respectively; 3) respective treatment of compound **45a** and **45b** with LDA at −78 °C and followed by MeI offered lactone **46** and its enantiomer *ent*-**46**.

Keyword: chiral rhodium catalyst, quaternary chiral center, 2,4-diaryl-4-oxobutanamindes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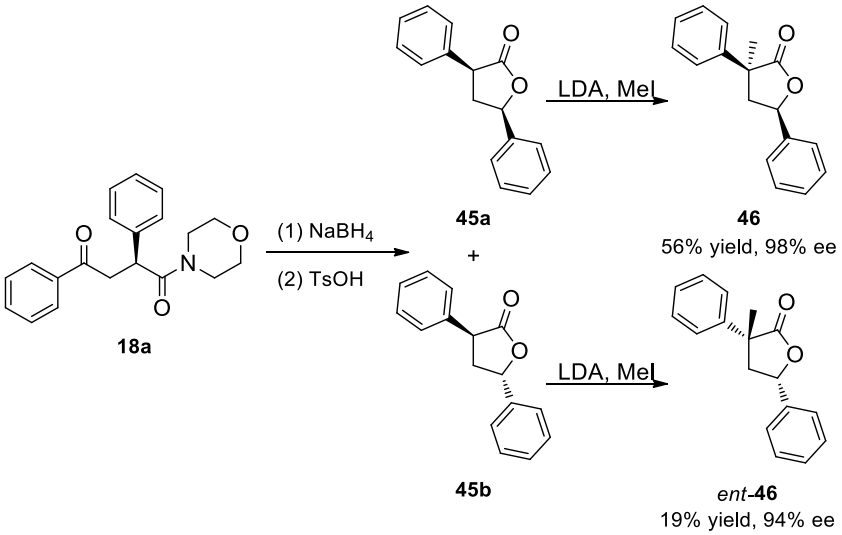
(1) NaBH4
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LDA, MeI
LDA, MeI
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56% yield, 98% ee
ent-46
19% yield, 94% ee

第七章 參考文獻

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