

CBC SEMINAR ANNOUNCEMENT



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Asymmetric Hydrogenation Using Chiral Tridentate Ligands

Catalytic asymmetric hydrogenation of prochiral ketones is a convenient and economical method to prepare chiral alcohols, which are significant building blocks in pharmaceuticals and natural products. Since Noyori's milestone work in the 1990s wherein the BINAP-ruthenium-diamine catalytic system was originally developed for hydrogenation of ketones, numerous ligands including bidentate and tridentate ligands have been synthesized and investigated in metal catalyzed asymmetric hydrogenation.

Because of the stability and high activity, tridentate ligands have shown promising potential in ketone reduction. In 1998, we had developed a novel tridentate NNN ligand (**ambox**) which had been successfully used in asymmetric transfer hydrogenation of ketones, which represents the first application of a tridentate ligand in asymmetric (transfer) hydrogenation.^[1] Since then, chiral tridentate ligands have attracted increasing attention in highly efficient and enantioselective ketone hydrogenation. In 2010, **indan-ambox**, a derivative of **ambox**, had been applied in asymmetric hydrogenation of ketones with excellent enantiocontrol albeit with low efficiency.^[2] To solve the efficiency problem, our group has recently developed a series of ferrocene-based tridentate ligands, **f-amphox**,^[3] **f-amphol**,^[4] **f-ampha**,^[5] and **f-amphamide**,^[6] which had shown super activity in iridium-catalyzed asymmetric hydrogenation of ketones (TONs up to 1 000 000). Compared to Noyori's BINAP-ruthenium-diamine catalytic system, iridium (III)-hydride complex ligated with these tridentate ligands have several features, including (1) extreme stability because of d6 configuration of Ir (III); (2) extreme activity because of the two Ir-H trans effect; (3) devoid of product inhibition due to coordinative saturation.

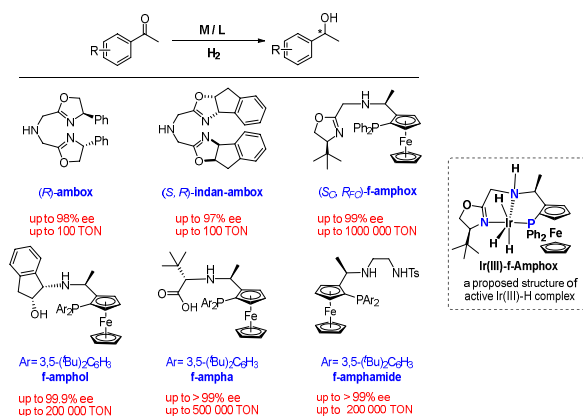


Fig 1. Application of Chiral Tridentate Ligand in Asymmetric Hydrogenation

References

- [1] Jiang, Y.; Jiang, Q.; Zhang, X. *J. Am. Chem. Soc.* **1998**, *120*, 3817. [2] Li, W.; Hou, G.; Wang, C.; Jiang, Y.; Zhang, X. *Chem. Commun.*, **2010**, 46, 3979. [3] Wu, W.; Liu, S.; Duan, M.; Tan, X.; Chen, C.; Xie, Y.; Lan, Y.; Dong, X.-Q.; Zhang, X. *Org. Lett.* **2016**, *18*, 2938. [4] Yu, J.; Jiao, L.; Yang, Y.; Wu, W.; Xue, P.; Chung, L. W.; Dong, X.-Q.; Zhang, X. *Org. Lett.* **2017**, *19*, 690. [5] Yu, J.; Duan, M.; Wu, W.; Qi, X.; Xue, P.; Lan, Y.; Dong, X.-Q.; Zhang, X. *Chem. Eur. J.* **2017**, *23*, 970. [6] Liang, Z.; Yang, T.; Gu, G.; Dang, L.; Zhang, X. *Chin. J. Chem.* **2018**, *36*, 851.

Date: 3rd October 2019 (Thursday)
Time: 11.00am – 12.30pm
Venue: SPMS Graduate and Research
Conference Room
Host: Associate Professor Naohiko Yoshikai