Enantioselective Synthesis of Planar-Chiral Ferrocenes
Initiated by C-H Bond Cleavage

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Ferrocene-containing compounds have unique chemical and thermal stabilities, and redox
properties. One of their promising applications is the use as chiral ligands: for example, planar-chiral
ferrocenyl phosphine XyliPhos is an efficient ligand for the Ir-catalyzed asymmetric hydrogenation in
industrial scale. Therefore, various types of asymmetric synthesis of planar-chiral ferrocene compounds
have been reported. Recently, enantioselective synthesis of planar-chiral ferrocenes initiated by
transition metal −catalyzed C-H bond activation is a hot topic.

Actually, we achieved the first example of intermolecular enantioselective C-H alkylation of
ferrocenes with various alkenes by using an Ir-chiral diene catalyst.1 The isoquinolyl moiety as a
directing group enabled the high regioselectivity and enantioselectivity.

We further reported two different types of intramolecular reactions: the intramolecular Si-H/C-H
coupling of 2-(hydrosilyl)arylferrocenes gave planar-chiral benzosiloloferrocenes. The enantioselective
cross dehydrogenative coupling proceeded efficiently by using a Rh-chiral diene catalyst.2 We further
developed a highly enantioselective cycloisomerization for the synthesis of planar-chiral naphthalene-
fused ferrocene derivatives. The reaction of 2-alkynylferrocenylbenzene derivatives proceeded to give
the desired cycloadducts with up to 97% ee under the mild conditions by using a chiral cationic Pt(II)-
diphosphine catalyst.3

References

21st International Conference on Organic Synthesis, December 11-16, 2016, Mumbai, India