Development of Chiral Lewis Acid Complexes with High Hydrophobicity as Self-healing Catalysts for Reactions in Water

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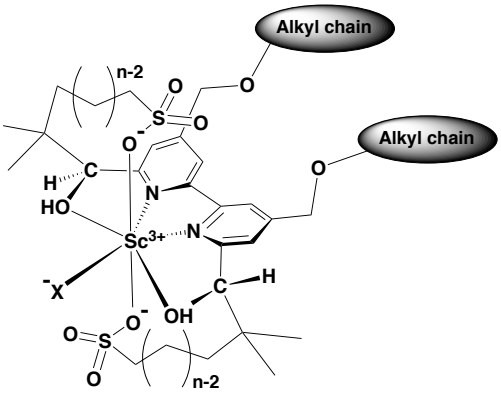
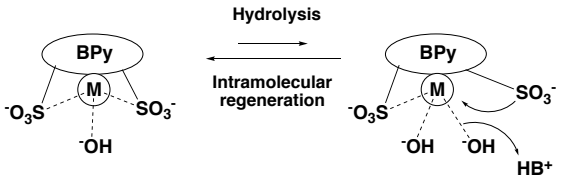
Organic reactions in water have attracted a great deal of attention due to advantages of safety and environmental harmony. Nowadays, chiral Lewis acid-catalyzed reactions in water have been well developed and widely applied.[1] However, there remains a problem of hydrolysis of central metal, which limits catalyst lifetime and sustainability. To solve such problems, we proposed an anionic chiral ligand by modifying a chiral 2,2'-bipyridine ligand (C(n)-Sc-ROBPy(X)).[2] It may repair itself continuously without external energy source and activation. It is supposed to have extremely long catalyst lifetime. This property can be defined as "self-healing". We expected that alkyl chains substituted on 4,4'-position of a bipyridine will provide a high hydrophobicity to realize efficient enantioselective reactions in water. We evaluated the catalyst activity in water and studied the self-healing ability by several analytical methods such as NMR study, ICP analysis, elemental analysis, IR study and pH titration.



C(n)-Sc-ROBPy(X)



Initial catalyst **Deactivated catalyst**

BPy: 2,2'-bipyridine
B: base

Proposed self-healing process

- **√ NMR study**
- **√ ICP&Elemental analysis**
- **√ IR study**
- **√ pH titration**

etc.

1) Kobayashi, S. *et al. In Book Chiral Lewis Acids in Organic Synthesis, ed. by J. Mlynarski, Wiley-VCH*, **2017**, 299-344.
2) Kobayashi, S. *et al.* 日本化学会第100回春季年会, 2B4-12.