Mechanistic and Synthetic Study of Radical Reactions Initiated by Single Electron Transfer Process

Li Zhang and Lei Jiao*

Center of Basic Molecular Science, Department of Chemistry, Tsinghua University, Beijing 100084, China

Background
(a) Radical Reactions Initiated by Single Electron Transfer (ref. 1, 2):

(b) Early Synthetic Study (ref. 3):
Discovery of a novel diboron/methoxide/pyridine system.

(c) Unsolved Problems:
1. Structure of Electron Donors?
2. Mechanistic Problems?
3. More Synthetic Application?

Mechanistic Study
(a) Isolation and Characterization of Intermediates (ref. 4):

(b) Characterization of Super Electron Donors (ref. 4):

Both are super electron donors.

More Synthetic Application
(a) As a Ground State Electron Donor (ref. 3, 4):

(b) As an Excited State Super Electron Donor (ref. 5):

Activation of aryl chlorides via photo-induced electron transfer.

(c) As a Strong Nucleophile (ref. 6):

Generation of alkyl radicals via an S$_2$P$_2$ homolytic cleavage pathway.

Summary
◆ Super electron donors in the diboron/methoxide/pyridine system were isolated and characterized.
◆ A general and practical organocatalytic radical generation strategy was developed based on mechanistic study results.

Reference

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