PART II

Ferric Chloride Mediated Michael Addition of Dicarboxylic Acid Esters to \( \alpha,\beta \)-Unsaturated Ketones

II.3 Conclusion

Defined as the Lewis acid- or Lewis base-catalyzed nucleophilic addition to the \( \beta \)-carbon of an \( \alpha,\beta \)-unsaturated carbonyl compound, Michael addition reaction has exceeded every chemist’s expectation in its flexibility and applicability in synthetic organic chemistry. Innumerable catalysts and countless nucleophiles are now in record for use in Michael addition reactions according to one’s requirement and convenience. However, it is highly intriguing to notice that succinic acid esters are missing from the long list of nucleophiles used in Michael additions. It is equally intriguing to find that ferric chloride, a non-hazardous chemical and widely used Lewis acid, has never been reported as a catalyst in any Michael addition of malonates, a widely appreciated pro-nucleophile in a large number of Michael addition reactions.

During this investigation, ferric chloride has been examined as a catalyst in sixteen different Michael addition reactions involving malonic acid methyl ester as the pro-nucleophile, and eleven different reactions involving succinic acid methyl ester as the pro-nucleophile. Thus, this investigation has established ferric chloride as an effective Lewis acid catalyst in Michael addition reactions of malonic acid and succinic acid methyl esters.

Michael addition of succinic acid ester-derived nucleophile to an \( \alpha,\beta \)-unsaturated carbonyl compound generates two chiral centers in a single step reaction to afford a functionally dense molecule. Such a Michael adduct can be a much sought-after building
block in the synthesis of complex and large natural and bioactive molecules. This investigation has introduced succinic acid methyl ester as a credible pro-nucleophile in several Michael addition reactions. Further work to examine stereoselectivity in these reactions would only add more colour to this investigation, which is an initiation only to show the tip of an ice berg.