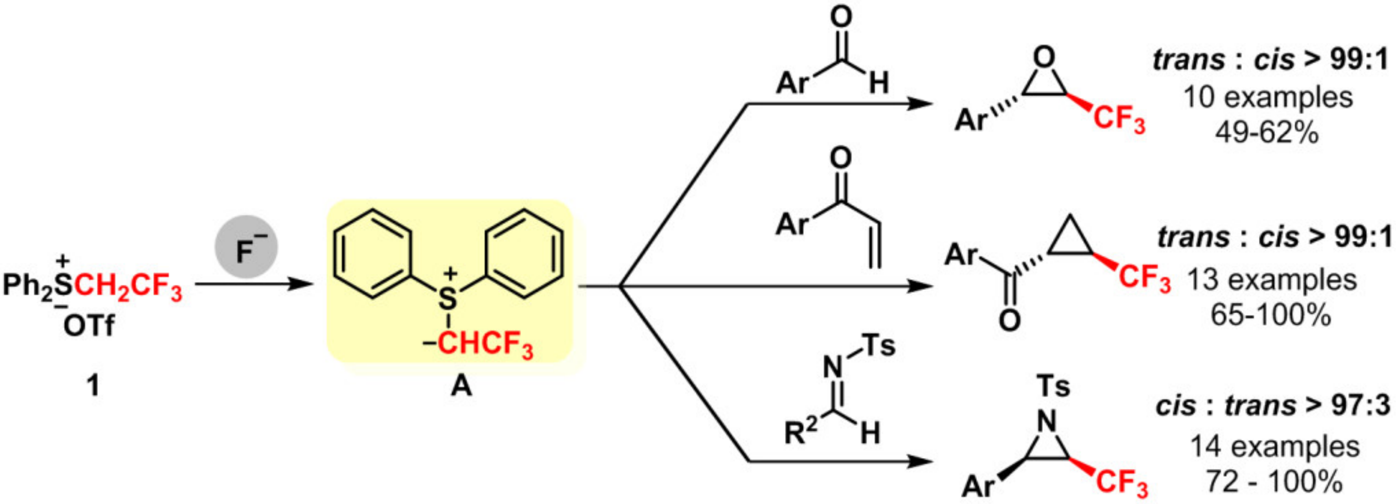
Diastereoselective Johnson-Corey-Chaykovsky trifluoroethylidenation

The trifluoromethyl - substituted three-membered rings including epoxides, cyclopropanes and aziridines are very interesting and useful structures which have received much attention in pharmaceuticals, agrochemicals and synthetic chemistry. Therefore, significant efforts have been directed towards the development of efficient methods for their synthesis. Although various strategies have been well established, such as intramolecular cyclization of CF_3-substrates and [2+1] cyclization of C=X (X = C, N, O) substrates with carbene, they suffer from the tedious procedure to prepare CF_3-substrates or the use of potentially explosive and toxic reagent.



As is known to all, epoxides, cyclopropanes and aziridines can be straightforwardly and efficiently obtained from the Johnson-Corey-Chaykovsky reaction by using a sulfonium ylide. Nevertheless, despite the fact that sulfonium salt 1 has already been known for over twenty years, this reaction with trifluoromethylated sulfonium ylide has never been applied in the synthesis of trifluoromethyl-epoxides, -cyclopropanes and –aziridines, which should be because of the instability of sulfonium ylide A generated from salt 1. Ylide A is unstable since ?-fluorine elimination is very easy to happen, leading to the decomposition of ylide A. But this tendency might be suppressed by the presence of fluoride ion.

In this work, trifluoroethylsulfonium triflate 1 has been developed into a versatile and convenient sulfur ylide reagent for Johnson-Corey-Chaykovsky trifluoroethylidenation by using fluoride as the base. The reactions proceeded smoothly to afford the final products with excellent diastereoselectivity. Interestingly, trifluoromethyl-epoxides, -cyclopropanes were obtained as trans-diastereomers, while trifluoromethyl-aziridines were found to be cis-diastereomers.

Publication

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