Langlois Reagent: An Efficient Trifluoromethylation Reagent

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Abstract **Key words** Langlois reagent, trifluoromethylation, free radical, fluoroorganic synthesis, sodium trifluoromethanesulfinate or sodium triflinate

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The fluorine atom has a grand reception in pharmaceutical, material, and agrochemical industries as it dramatically alters the physical, chemical, and metabolic properties of organic compounds in its presence. Hence, its incorporation as an atom or fluorine-containing functional groups in organic molecules remains a huge interest among the organic chemists.[1] Among the fluorine-containing functional groups, the trifluoromethyl (CF_3) group is the most common group that could improve molecular properties and hence predominantly found in pharmaceutical substances. Therefore, the development of novel methods to build the C–CF_3 bond is of great interest, and several other reagents have been developed.[2]

Among the other available trifluoromethylating reagents, such as Togni, Umemoto, Ruppert–Prakash reagents, etc., Langlois reagent (CF_3SO_2Na) has been extensively focused in the past few decades due to its commercial availability, inexpensiveness, stability, and, importantly, its capability of transferring the CF_3 group into a large variety of substrates via both electrophilic and free-radical mechanistic pathways.[3,4] Interestingly, this reagent can also be used to install SCF_3, $SOCF_3$, etc. functions into organic compounds.[5]

In 1991, the sodium trifluoromethanesulfinate ($NaSO_2CF_3$) reagent was first introduced by the Langlois group for the introduction of the trifluoromethyl group in an aromatic system and the reagent was first prepared from trifluoromethylchloride and sodium dithionite[6] as shown in Scheme 1. However, this reagent was unexplored for fifteen years. In