

SYNLETT Spotlight 82

Trifluoromethanesulfonic (triflic) Anhydride

Compiled by Sandipan Sarkar



This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research

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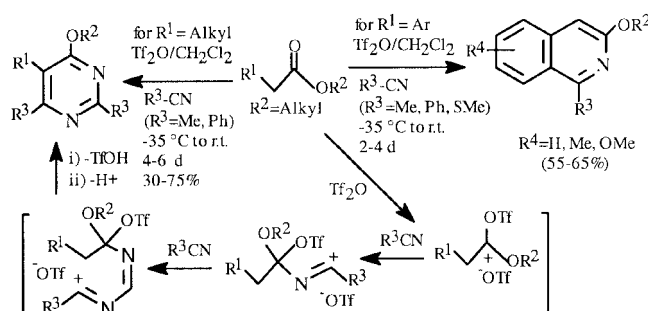
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Introduction

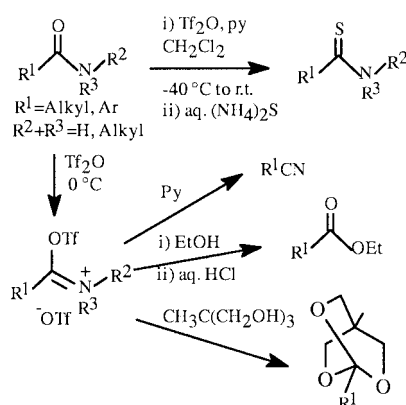
Trifluoromethanesulfonic (triflic) anhydride $[(CF_3SO_2)_2O; Tf_2O]$ has proved to be a versatile reagent in organic synthesis over the last few decades.¹⁻³ Due to the excellent leaving group properties of the triflate group, Tf_2O finds its use in the conversion of various compounds to triflates which can be transformed into other useful products. Detailed studies have established triflates to be some 2×10^4 to 2×10^5 times more reactive than the comparable tosylates.¹

Abstract

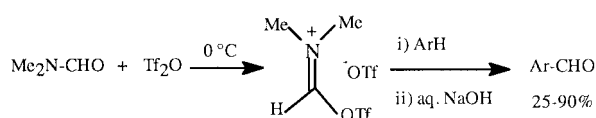
(A) The reaction of aliphatic esters with aliphatic and aromatic nitriles in presence of Tf_2O affords 4-alkoxypyrimidines. This reaction proceeds through the intermediacy of alkoxy (trifloxy) carbenium ions⁶ and leads to isoquinolines in case of arylacetic acid esters.⁷ A similar reaction with ketones offers a broad scope for the preparation of functionalised pyrimidines.⁸



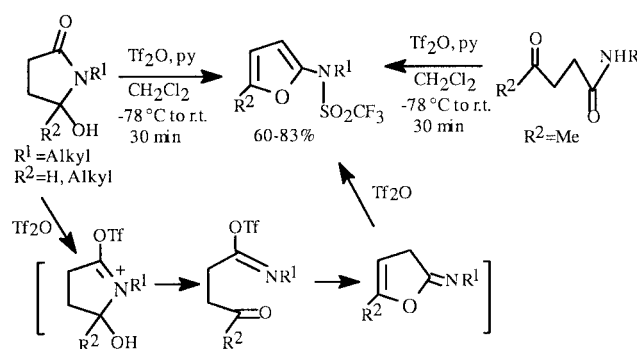
(B) The iminium and iminotriflates derived from the treatment of secondary and tertiary amides has opened up broad avenues for transformations of the amide functionality. These salts are versatile reagents that can react with various N-, O- and S-nucleophiles, thereby transforming amide group into other functionalities.⁹



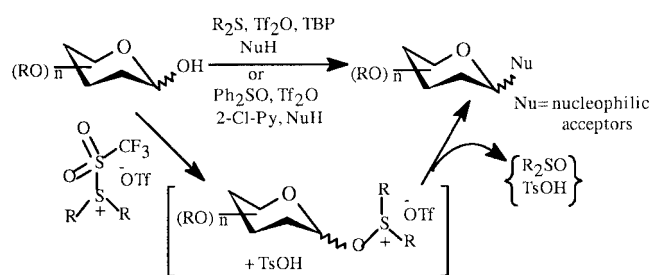
(C) $\text{ Tf}_2\text{O}$ has been utilised as a mild activation reagent in Vilsmeier–Haack formylation. Less nucleophilic aromatics can be formylated with $\text{ DMF/Tf}_2\text{O}$.¹⁰



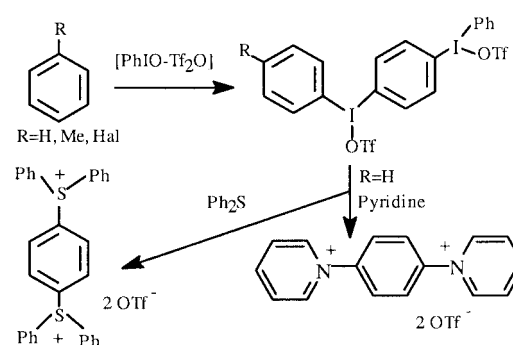
(D) α -Trifluoromethylsulfonamido furans, an important class of compounds, have recently been prepared by $\text{ Tf}_2\text{O}$ -mediated cyclisation of ketoamides and 5-hydroxy substituted pyrrolidines.¹¹



(E) $\text{ Tf}_2\text{O}$ is used extensively in carbohydrate chemistry, frequently for glycosylation. Recently a novel sulfide- and sulfoxide-mediated dehydrative glycosylation technique employing $\text{ Tf}_2\text{O}$ has been developed.¹²



(F) In hypervalent iodine chemistry, $\text{ PhIO-Tf}_2\text{O}$ finds its use in the preparation of 1,4-disubstituted benzene derivatives. The extreme reactivity of the above complex even towards non-activated benzene derivatives affords (*p*-phenylene)bis(aryliodonium) ditriflates. This subsequently leads to the products.¹³



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