Synthesis of Aromatic Sulfones from SO_2 and Organosilanes, under Metal-free Conditions

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PURPOSE OF THE ABSTRACT

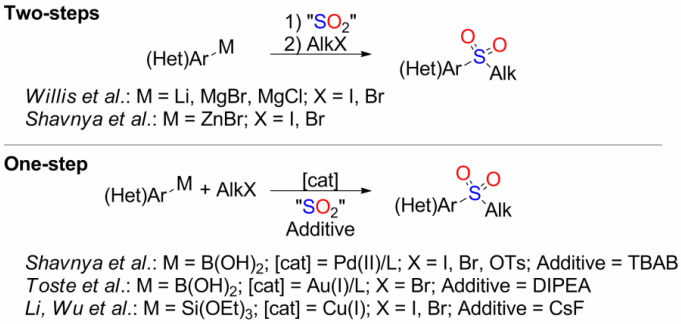
The sulfone functional group (RSO2R?) has found widespread applications in organic chemistry, due to its unique physico-chemical properties (stability, lipophilicity, H-bonding etc.) [1] and many aryl- or heteroarylsulfones derivatives are currently exploited as drugs (e.g. bicalutamide, eletriptan and Vioxx) or herbicides.

The presence of these structural motifs in pharmaceuticals asks for mild and step efficient synthesis methodologies. Classical synthetic routes to aryl- or heteroarylsulfones generally comprise the oxidation of sulfides or the sulfonylation of arenes with toxics reagents under harsh conditions. Recently several examples of sulfinate salts coupling leading to sulfones under mild conditions have been developed. These methods however require two steps with the use of strong nucleophiles such as organomagnesium or organolithium reagents [2]. In 2013, Shavnya et al. reported the one step reaction using milder nucleophiles such as organoborron reagents, but transition metals catalysts are necessary (Scheme 1) [3] .

Among available nucleophiles, organosilanes are stable, easy to prepare and to handle and non-toxic. Their use might require activation by fluoride or alkoxide salts.

We herein report the one-step, metal free, synthesis of aryl and heteroarylsulfones from silanes, SO2 and an alkylhalide, using fluoride anions as promotors at room temperature (scheme 2). Computational studies allowed proposing a mechanism and elucidating the experimentally observed difference in reactivity especially between pyridyl and phenyl silane derivatives, by highlighting the triple catalytic role of SO2.

FIGURES



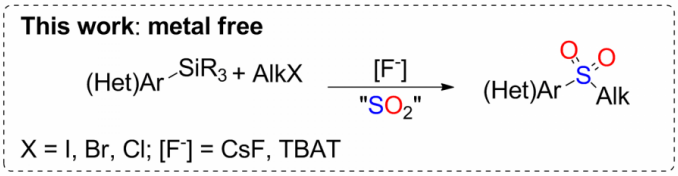


FIGURE 1
Scheme 1
State of the art sulfone synthesis from SO2.

FIGURE 2
Scheme 2
The one step, metal free, developed synthesis of aryl- and heteroarylsulfone from SO2.

KEYWORDS
Sulfones | organosilane | metal free

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