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Niklas von Wolff, Joelle Char, Thibault Cantat

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Valorization of Small Molecules

From Mechanism to New Reactions

N. von Wolff, J. Char, T. Cantat *
CEA Saclay, NIMBE, 91191 Gif-sur-Yvette, France

thibault.cantat@cea.fr

Small molecules, such as CO₂, SO₂, or nitrous oxides NO_x are generally regarded as pollutants and wastes. However, recent developments made it possible to think about small molecules as building blocks for organic synthesis, especially using CO₂. As C–C bonds are universal in organic chemistry, the formation of these bonds from CO₂ is of key interest. We herein report a novel reaction of unactivated organosilanes with CO₂ to form esters and a polyester material for the first time, where CO₂ plays both the role of the reactant and a catalyst.¹

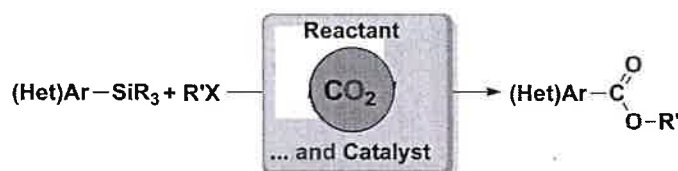


Figure 1 CO₂ acts both as reactant and catalyst in the formation of esters from heteroarylsilanes as demonstrated by DFT calculations.

Understanding this reaction and the unique catalytic role of CO₂ using DFT calculations enabled the development of a novel transformation involving SO₂. For the first time, SO₂ is incorporated in a one-pot one-step process to form aryl alkyl sulfones, a major class of compounds in the organic chemistry with wide applications in synthesis, from pharmaceuticals to natural products.²

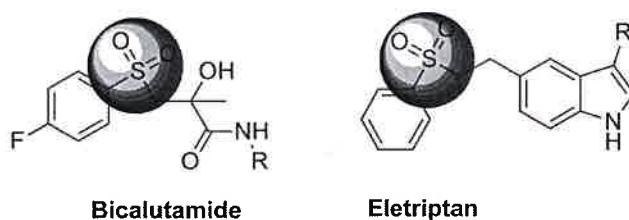


Figure 2 Examples of pharmaceuticals bearing the sulfonyl group

¹ X. Frogneux, N. von Wolff, P. Thuéry, G. Lefèvre, T. Cantat *Chem. Eur. J.* 10.1002/chem.201505092

² N. von Wolff, J. Char, T. Cantat, A process for the synthesis of sulfones and sulfonamides, **2015**, EP15306966