



## Valorization of small molecules: from mechanisms to new reactions

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### ► To cite this version:

Niklas von Wolff, Joelle Char, Thibault Cantat. Valorization of small molecules: from mechanisms to new reactions. 42 nd International Conference on Coordination Chemistry (ICCC 2016), Jul 2016, Brest, France. cea-02346073

**HAL Id: cea-02346073**

**<https://cea.hal.science/cea-02346073>**

Submitted on 4 Nov 2019

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## Valorization of Small Molecules

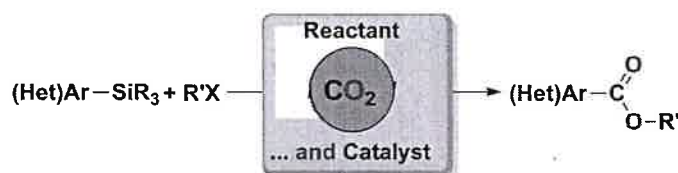
### From Mechanism to New Reactions

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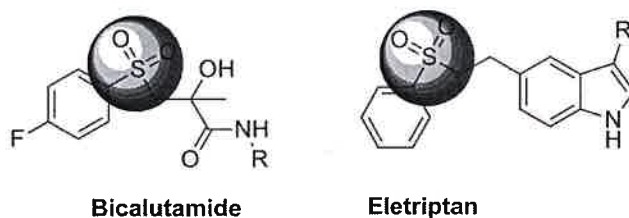
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Small molecules, such as CO<sub>2</sub>, SO<sub>2</sub>, or nitrous oxides NO<sub>x</sub> are generally regarded as pollutants and wastes. However, recent developments made it possible to think about small molecules as building blocks for organic synthesis, especially using CO<sub>2</sub>. As C–C bonds are universal in organic chemistry, the formation of these bonds from CO<sub>2</sub> is of key interest. We herein report a novel reaction of unactivated organosilanes with CO<sub>2</sub> to form esters and a polyester material for the first time, where CO<sub>2</sub> plays both the role of the reactant and a catalyst.<sup>1</sup>



**Figure 1** CO<sub>2</sub> 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 CO<sub>2</sub> using DFT calculations enabled the development of a novel transformation involving SO<sub>2</sub>. For the first time, SO<sub>2</sub> 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.<sup>2</sup>



**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