Synthesis of Amides using Supported Gold Nanoparticles and Base as Catalysts

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ABSTRACT

Selective oxidation of alcohols is one of the most important reactions in organic chemistry and is used in the production of many bulk commodities, high-value fine chemicals, agrochemicals and pharmaceuticals. In the search for a more sustainable chemical industry, much effort has been devoted the development of efficient oxidation catalysts that uses molecular oxygen as oxidant. From the standpoint of green and sustainable chemistry, these oxidations are attractive because oxygen is a cheap and readily available oxidant that produces water as the only by-product.[1]

Here, I present the investigations of a novel reaction protocol for the synthesis of amides using a catalytic system consisting of supported gold nanoparticles and base in methanol,[2,3] see Figure 1.

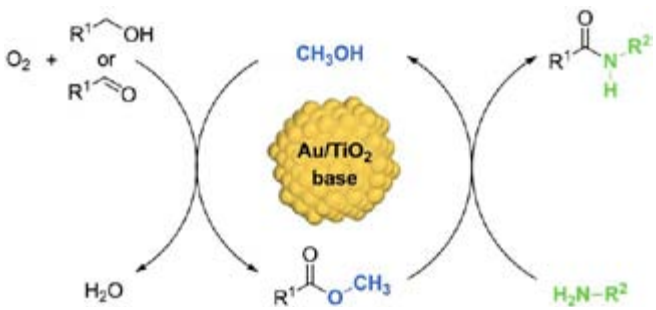

Figure 1. One-pot synthesis of amides using supported gold nanoparticles and base as catalysts.

In the first step of the reaction, the gold-catalyzed oxidation of an alcohol or aldehyde in methanol yields a methyl ester. In the second step, an amine is added and the methyl ester is converted into the desired amide by base-catalyzed aminolysis. As the same base is promoting both steps of the reaction, the synthesis can be performed in a convenient one-pot procedure without isolation or purification of the intermediate. The employed oxidant is pure molecular oxygen and the reaction can be performed under mild reaction conditions (25–65°C, atmospheric pressure). The reaction protocol was applied to a number of alcohols and amines, demonstrating the procedure to be versatile and applicable to a broad range of substrates. Furthermore, the involved reaction mechanism was discussed on the basis of kinetic data and theoretical density functional theory computations.

References

[1] G. Franz and R. A. Sheldon, 'Oxidation', Ullmann's Encyclopedia of Industrial Chemistry, 6th edition.

[2] S. Kegnæs, J. Mielby, U. V. Mentzel, T. Jensen, P. Fristrup, A. Riisager, *Chem. Commun.* **2012**, *48*, 2427.

[3] J. Mielby, A. Riisager, P. Fristrup, S. Kegnæs, Catal. Today. **2012**, DOI:10.1016/j.cattod.2012.04.026