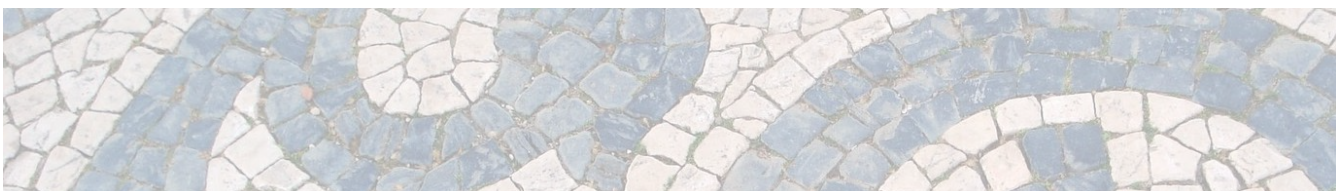


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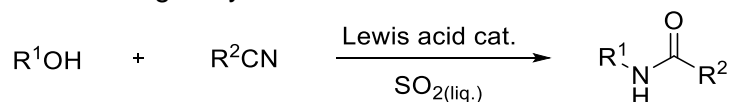


RITTER REACTION IN LIQUID SULFUR DIOXIDE

D. Posevins, V. Kumpinsh, M. Turks*

Faculty of Material Science and Applied Chemistry, Riga Technical University, P. Valdena str. 3, Riga, Latvia;
maris_turks@ktf.rtu.lv

Ritter reaction is associated with a one-pot process for amide bond formation, that involves nitrile and a group, capable of giving a relatively stable carbenium ion (originally - alcohol or alkene) in strongly ionizing acidic medium.^[1] The classical Ritter reaction involves use of at least stoichiometric amounts of a corrosive Brønsted acid (i.e., conc. H₂SO₄), thus often limiting its applicability to compounds containing acid labile functional groups.^[2] Nevertheless, because of its atom economy and easy application Ritter reaction proved to be useful in synthesis of various biologically active molecules and drugs.^[3] Over past two decades a huge progress has been made in development of catalytic variations of Ritter reaction.^[4] Sulfur dioxide is not only considered to be a useful building block in synthetic organic chemistry but also can be easily liquefied to give colorless liquid, that in turn can be utilized as commercially acceptable solvent.^[5] Unique characteristics of liquid sulfur dioxide (SO_{2(liq.)}) as a reaction medium has been previously observed.^[6] One of such properties that we found particularly useful in context of Ritter reaction is the ability of SO_{2(liq.)} to facilitate formation of carbenium ions.^[7] Hence we have found that the Ritter reaction proceeds well in SO_{2(liq.)} (Scheme 1). Various Lewis and Brønsted acids were tested for their ability to promote this transformation in SO_{2(liq.)}. Reactivity of various alcohols towards Ritter reaction in our newly developed reaction conditions was also evaluated. The expected amides were obtained in good yields.



Scheme 1. Ritter reaction in liquid sulfur dioxide

Relatively low catalyst loading and activation of secondary alcohols towards Ritter reaction is a strong evidence of preferences of using SO_{2(liq.)} as a solvent for transformations involving carbocation intermediates.

References:

- [1] L. I. Krimen, D. J. Cota, *Org. React.* **1969**, *17*, 213.
 [2] (a) J. J. Ritter; P. P. Minieri, *J. Am. Chem. Soc.* **1948**, *70*, 4045; (b) J. J. Ritter, J. Kalish, *J. Am. Chem. Soc.* **1948**, *70*, 4048.
 [3] (a) M. Turks, I. Strakova, K. Gorovojs, S. Belyakov, Y. Piven, T. Khlebnikava, F. Lakhvich, *Tetrahedron* **2012**, *68*, 6131; (b) F. Zhou, M. Ding, J. Zhou, *J. Org. Biomol. Chem.* **2012**, *10*, 3178; (c) C. Hemptasin, A. T. Ung, S. Kanokmedhakul, K. Kanokmedhakul, R. Bishop, T. Satraruji, D. Bishop, *Monatsh. Chem.* **2012**, *143*, 955.
 [4] (a) A. Guérinot, S. Reymond, J. Cossy, *Eur. J. Org. Chem.* **2012**, *19*; (b) D. Jiang, T. He, L. Ma, Z. Wang, *RSC Adv.* **2014**, *4*, 64936.
 [5] (a) J. Luginina, *Synlett* **2014**, *25*, 2962.; (b) A. Deeming, E. Emmett, C. Richards-Taylor, M. Willis, *Synthesis* **2014**, *46*, 2701.
 [6] (a) P. Walden, *Chem. Ber.* **1902**, *35*, 2018; (b) G. A. Olah, *Angew. Chem. Int. Ed.* **1995**, *34*, 1393.
 [7] M. Feigel, H. Kessler, D. Leibfritz, A. Walter, *J. Am. Chem. Soc.* **1979**, *101*, 1943.