Organic Chemistry Portal

Reactions >> Name Reactions

Further Information

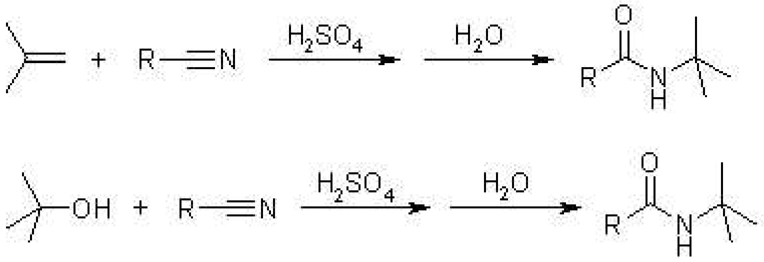
Literature

Related Reactions

Synthesis of amides

Synthesis of protected primary amines

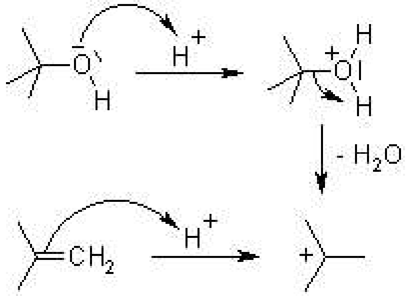
Ritter Reaction



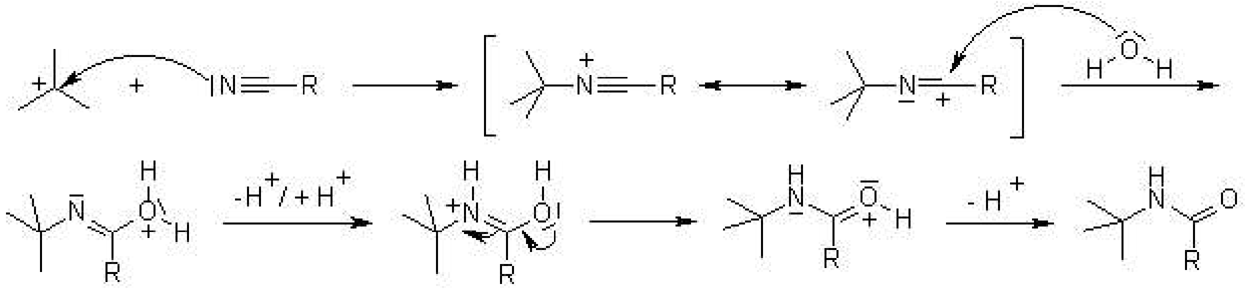
The acid-induced nucleophilic addition of a nitrile to a carbenium ion, followed by hydrolysis to the corresponding amide.

Mechanism of the Ritter Reaction

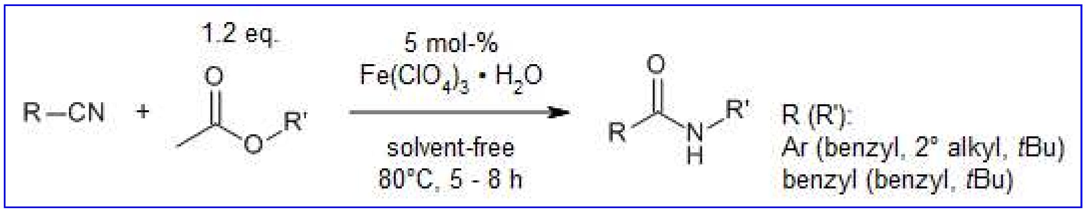
Any substrate capable of generating a stable carbenium ion is a suitable starting material; primary alcohols do not react under these conditions, with exception of benzylic alcohols:



The carbenium ion adds to the nitrile nitrogen to give a nitrilium ion intermediate, which undergoes hydrolysis to the corresponding amide upon aqueous work-up.

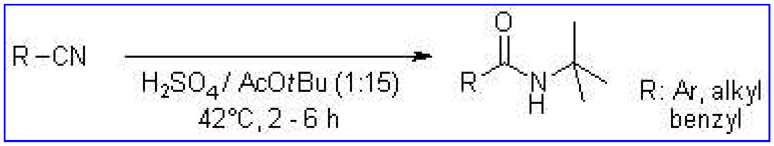


Recent Literature

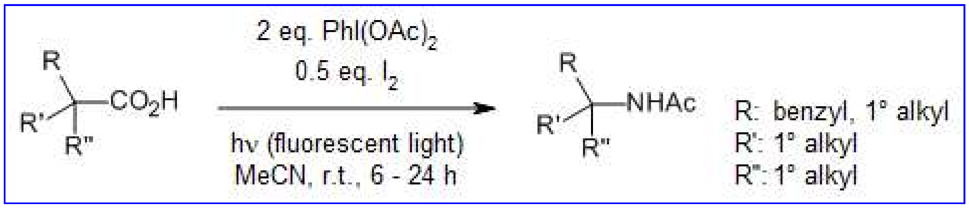


$Fe(ClO_4)_3 \cdot H_2O$-Catalyzed Ritter Reaction: A Convenient Synthesis of Amides from Esters and Nitriles

C. Feng, B. Yan, G. Yin, J. Chen, M. Ji, *Synlett*, **2018**, *29*, 2257-2264.

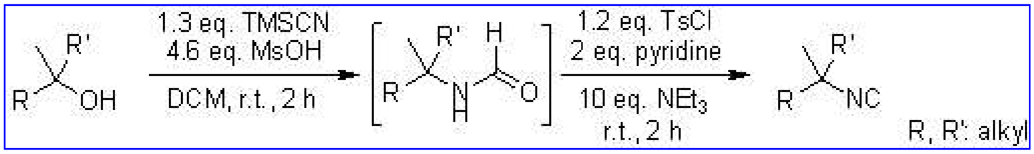


An efficient method for the conversion of aromatic and aliphatic nitriles to the corresponding *N*-*tert*-butyl amides: a modified Ritter reaction
K. L. Reddy, *Tetrahedron Lett.*, **2003**, *44*, 1453-1455.

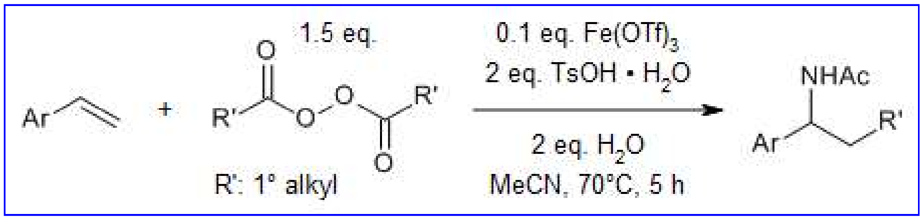


Hypervalent Iodine(III)-Mediated Decarboxylative Ritter-Type Amination Leading to the Production of α-Tertiary Amine Derivatives
K. Kiyokawa, T. Watanabe, L. Fra, T. Kojima, S. Minakata, *J. Org. Chem.*, **2017**, *82*, 11711-11720.

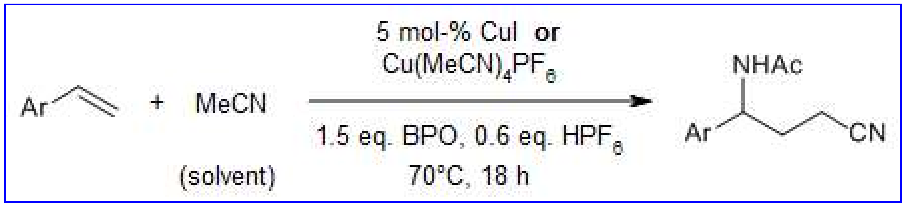
Synthesis of *N*-Benzhydrylamides from Nitriles by Ritter Reactions in Formic Acid
G. C. Gullickson, D. E. Lewis, *Synthesis,* **2003**, 681-684.



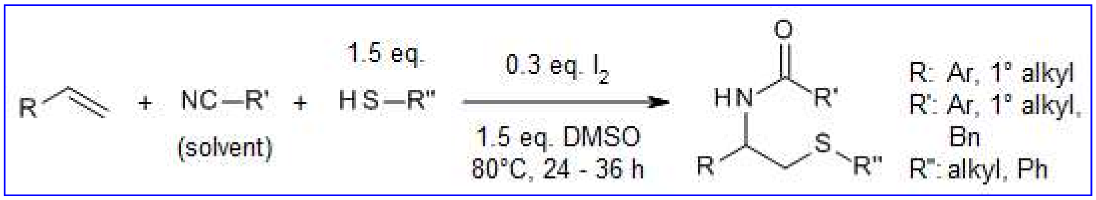
One-Pot Synthesis of Isocyanides from Alcohols
I. Okada, Y. Kitano, *Synthesis*, **2011**, 3997-4002.



A general alkylamination of vinylarenes and an unprecedented diastereoselective *anti*-carboamination of unsaturated esters provide amines and unnatural β-amino acids. This alkylamination is enabled by an iron catalyst and alkyl diacyl peroxides, that serve as both alkylating reagents and internal oxidizing agents.
B. Qian, S. Chen, T. Wang, X. Zhang, H. Bao, *J. Am. Chem. Soc.*, **2017**, *139*, 13076-13082.

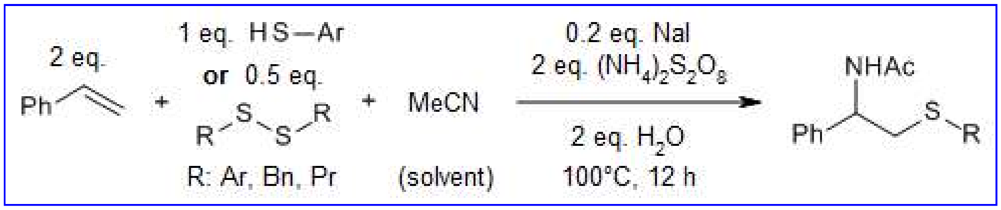


Copper-catalyzed carboamination of alkenes enables an efficient synthesis of γ-amino butyric acid (GABA) derivatives from alkenes. In this difunctionalization reaction, acetonitrile serves as the source of the carbon and nitrogen functionalities. A copper-catalyzed radical-polar crossover mechanism is proposed.
N. Zhu, T. Wang, L. Ge, Y. Li, X. Zhang, H. Bao, *Org. Lett.*, **2017**, *19*, 4718-4721.



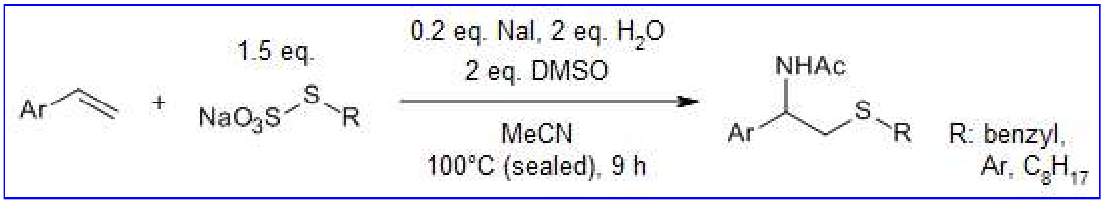
A direct difunctionalization protocol of alkenes with nitriles and thiols under metal-free synthesis conditions provides various β-acetamido sulfides with very good yields simply by using inexpensive molecular iodine as a catalyst, DMSO as a mild oxidant, and readily available thiols as thiolating reagents.

H. Cui, X. Liu, W. Wei, D. Yang, C. He, T. Zhang, H. Wang, *J. Org. Chem.*, **2016**, *81*, 2252-2260.



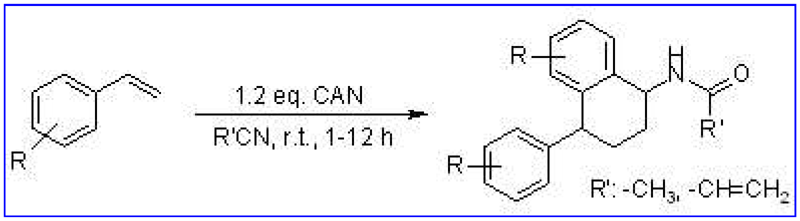
A transition-metal-free, direct, and efficient acetamidosulphenylation reaction of alkenes using nitriles as the nucleophiles offers a broad substrate scope and high regioselectivity and provides straightforward access to acetamidosulfide derivatives in good yields via a radical process.

Y. Zheng, Y. He, G. Rong, X. Zhang, Y. Wang, K. Dong, X. Xu, J. Mao, *Org. Lett.*, **2015**, *17*, 5444-5447.



In a direct and efficient method for the acetamidosulfenylation reaction of alkenes, NaI was used as a catalyst, DMSO as the oxidant, nitriles as both the solvent and nucleophiles and stable, readily available Bunte salts as thiolating reagents. The reactions were carried out under mild conditions to provide β-acetamido sulfides in good yields. Moreover, the reaction can be performed with alcohols as nucleophiles.

R. Zhang, Z. Yan, D. Wang, Y. Wang, S. Lin, *Synlett*, **2017**, *28*, 1195-1200.



A CAN-Induced Cyclodimerization-Ritter Trapping Strategy for the One-Pot Synthesis of 1-Amino-4-aryltetralins from Styrenes

V. Nair, R. Rajan, N. P. Rath, *Org. Lett.*, **2002**, *4*, 1575-1577.