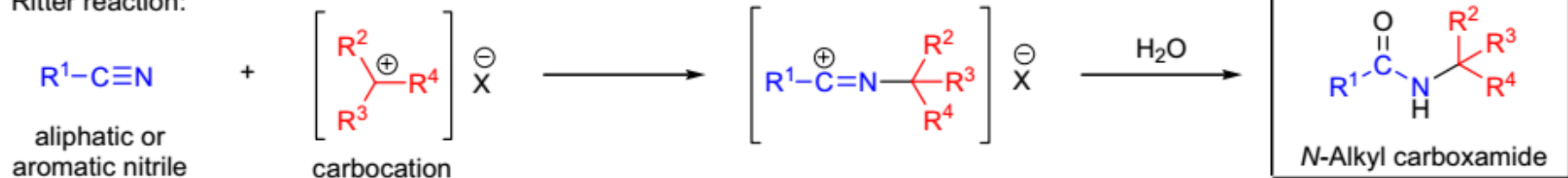
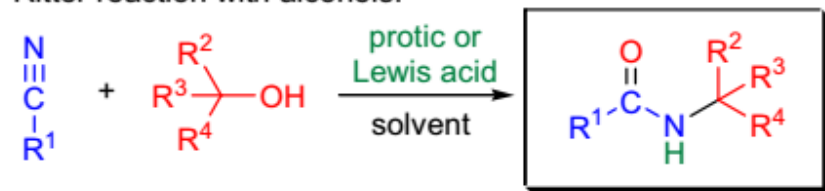


# Ritter Reaction

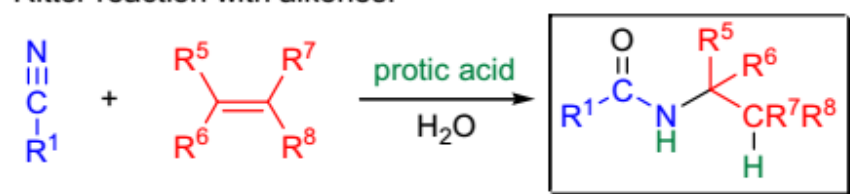
Ritter reaction:



Ritter reaction with alcohols:



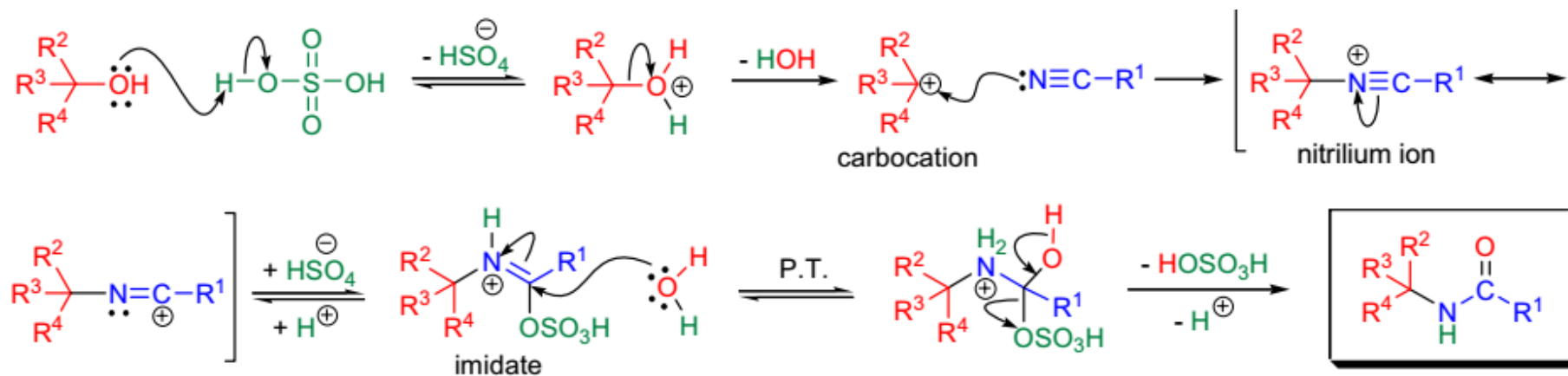
Ritter reaction with alkenes:



$\text{R}^1$  = H, 1°, 2° or 3° alkyl, alkenyl, alkynyl, aryl, heteroaryl;  $\text{R}^2$  = alkyl, aryl, heteroaryl;  $\text{R}^{3-4}$  = H, alkyl, aryl;  $\text{R}^{5-6}$  = alkyl, aryl;  $\text{R}^{7-8}$  = H, alkyl, aryl; **protic acid**:  $\text{H}_2\text{SO}_4$ ,  $\text{HClO}_4$ , PPA,  $\text{HCO}_2\text{H}$ ,  $\text{RSO}_3\text{H}$ ; **Lewis acid**:  $\text{AlCl}_3$ ,  $\text{BF}_3 \cdot \text{OEt}_2$ ,  $\text{SbCl}_5$ ; **solvent**: glacial AcOH,  $\text{H}_2\text{SO}_4$  (conc.),  $\text{Ac}_2\text{O}$ ,  $\text{CHCl}_3$ ,  $\text{CH}_2\text{Cl}_2$ ,  $n\text{-Bu}_2\text{O}$ ,  $\text{PhNO}_2$

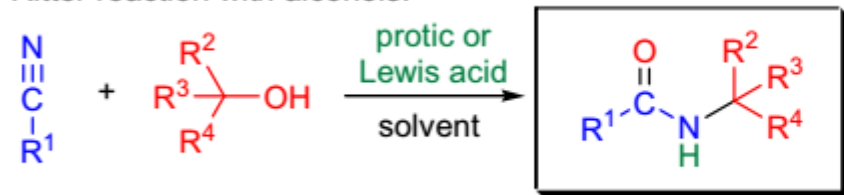
The formation of *N*-alkyl carboxamides from aliphatic- or aromatic nitriles and carbocations is known as the *Ritter reaction*

# Mechanism of Ritter Reaction

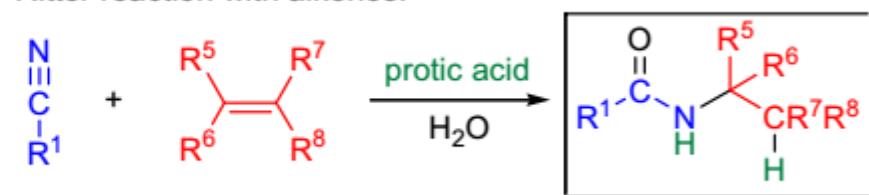


# Features of Ritter Reaction

Ritter reaction with alcohols:



Ritter reaction with alkenes:



- 1) the carbocation can be generated in a variety of ways from tertiary-, secondary, or benzylic alcohols, alkenes or alkyl halides;
- 2) the structure of the nitrile component can be varied widely and most substrates containing a cyano group will undergo the reaction, so, for example, besides aliphatic and aromatic nitriles, compounds like cyanogen and cyanamide will also react;
- 3) the classical reaction conditions involve the dissolution of the nitrile substrate in the mixture of acetic acid and concentrated sulfuric acid followed by the addition of the alcohol or alkene at slightly elevated temperatures (50-100 ° C);
- 4) besides protic acids, Lewis acids (e.g., SnCl<sub>4</sub>, BF<sub>3</sub>·OEt<sub>2</sub>, AlCl<sub>3</sub>, etc.) have been successfully employed in the *Ritter reaction* to generate the required carbocations;
- 5) the initially formed carbocation (which can be obtained from a large number of different functionalities) may undergo a *Wagner-Meerwein rearrangement* to give rise to the most stable carbocation before reacting with the nitrile;
- 6) 1,1-disubstituted alkenes give rise to regioisomerically pure products, but with 1,2-disubstituted alkenes a mixture of regioisomers may be formed;

# Applications of Ritter Reaction

