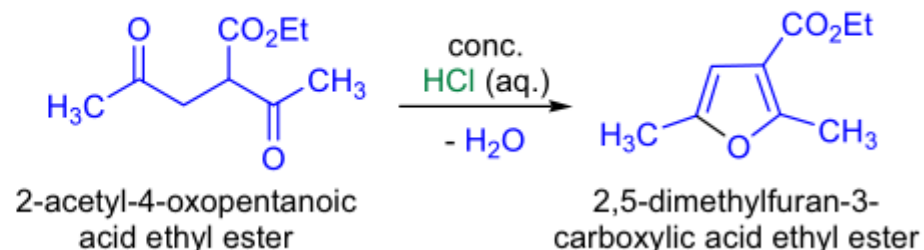
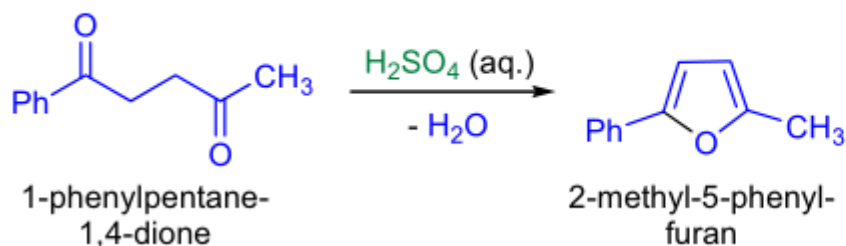


PAAL-KNORR FURAN SYNTHESIS

In 1884, C. Paal and L. Knorr almost simultaneously reported that 1,4-diketones upon treatment with strong mineral acids underwent dehydration to form substituted furans.

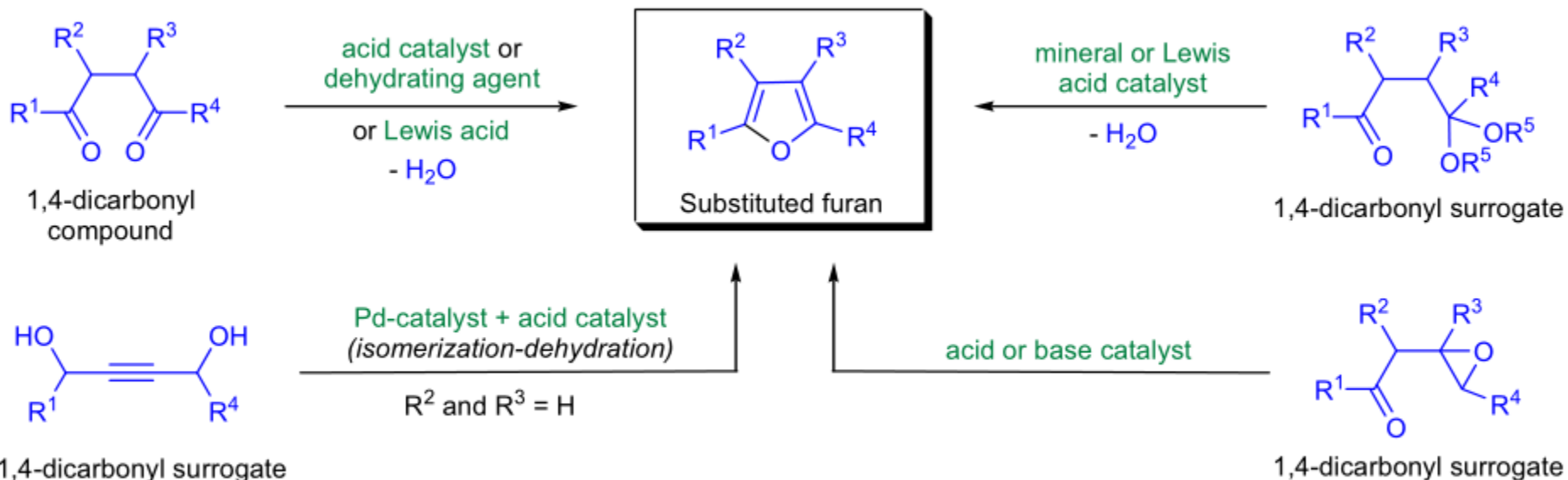
Paal & Knorr (1884):



Features

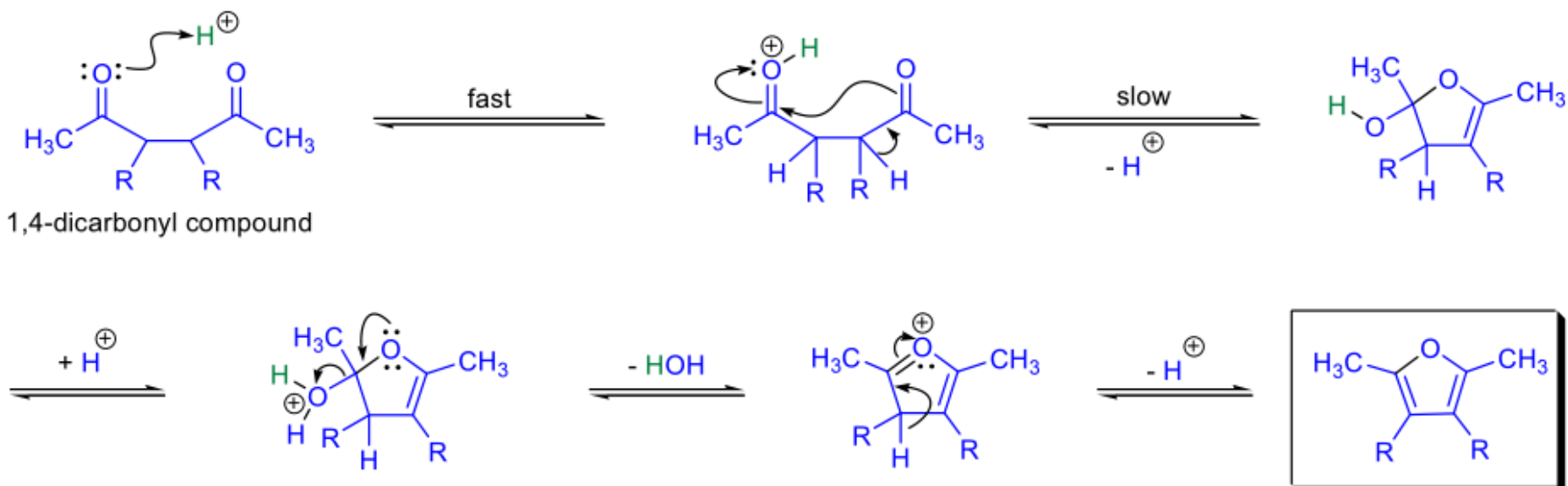
- 1) virtually any 1,4-dicarbonyl compound (mainly aldehydes and ketones) or their surrogates 9-12 are suitable substrates;
- 2) the dehydration is affected by strong mineral acids such as hydrochloric acid or sulfuric acid, but often Lewis acids and dehydrating agents (e.g., phosphorous pentoxide, acetic anhydride, etc.) can be used.

Paal-Knorr furan synthesis:

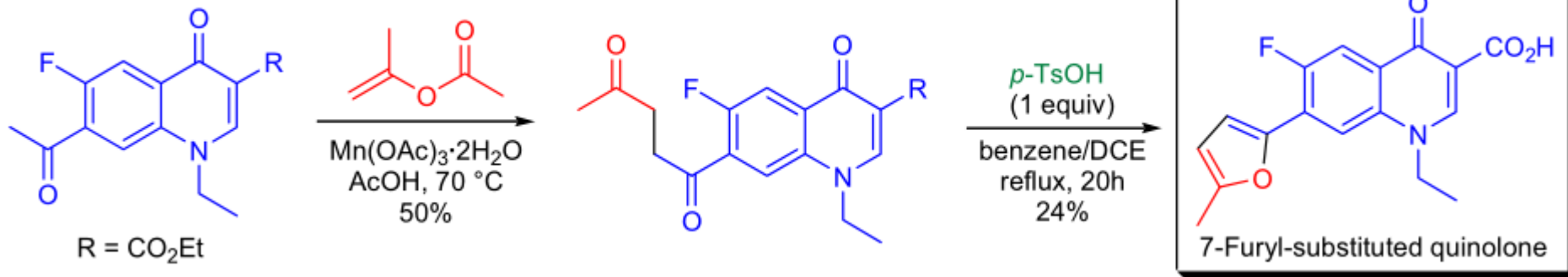
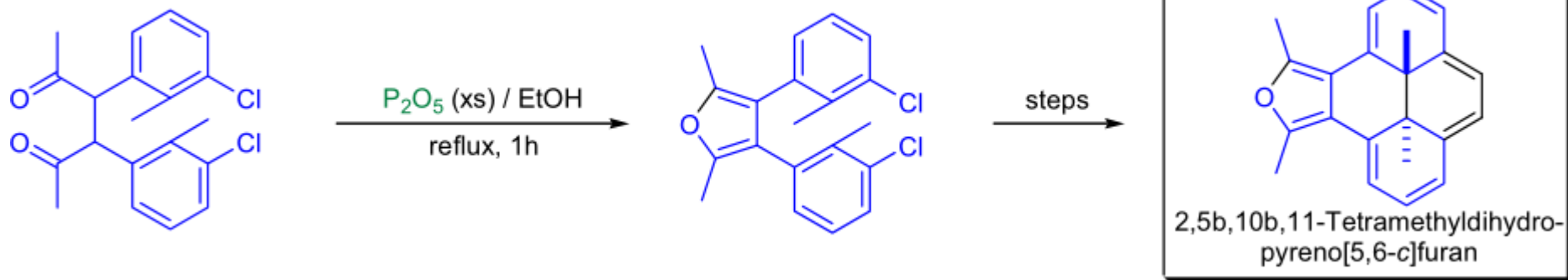
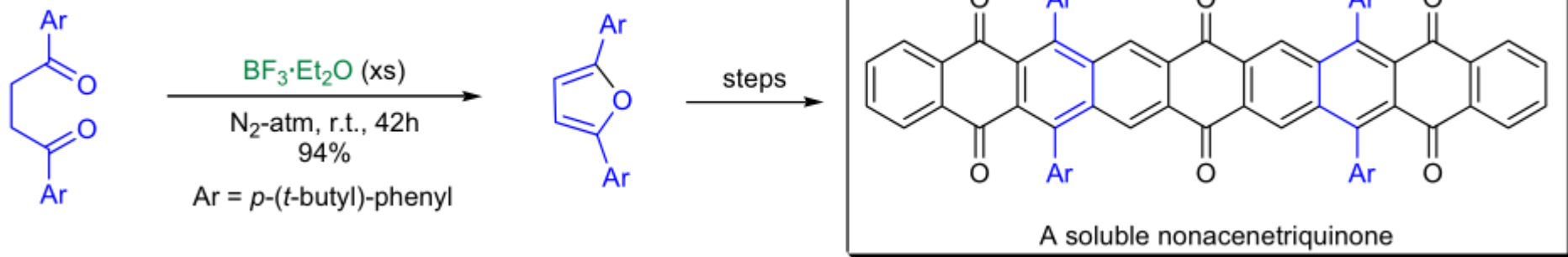


R¹ = H, alkyl, aryl; R²⁻³ = H, alkyl, aryl, CO₂-alkyl, CO₂-aryl; R⁴ = H, alkyl, aryl; R⁵ = CH₃, C₂H₅; **acid catalyst:** HCl, H₂SO₄, PPA, *p*-TsOH, (COOH)₂, Amberlyst 15; **Lewis acid:** ZnBr₂, ZnC₂, BF₃·Et₂O; **dehydrating agent:** P₂O₅, Ac₂O

Mechanism



Synthetic Applications



FEIST-BÉNARY FURAN SYNTHESIS

