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Alkynes to Heterocycles:
Gold Nanoparticle or Amine-Catalyzed Synthesis of 4-Pyrones and 4-Pyridones

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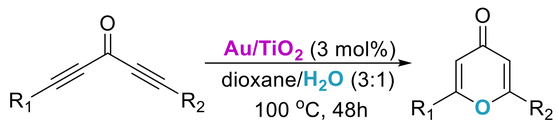
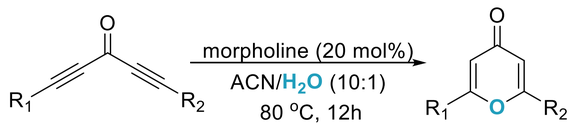
Abstract: Gold nanoparticles supported on TiO_2 promote the hydration and subsequent 6-*endo* cyclization of skipped diynones in aqueous dioxane, leading to 4-pyrones. Notably, the alternative formation of isomeric 3(2*H*)-furanones, which typically result from a competing 5-*exo* cyclization pathway when catalyzed by ionic Au(I) compounds, was not observed. When aqueous methylamine is used, the exclusive products are *N*-methyl-4-pyridones, achieved through a similar hydroamination and Au-catalyzed 6-*endo* cyclization pathway.[1] Alternatively, formation of 4-pyrones can occur under milder conditions through organocatalysis using a secondary amine such as morpholine, in an aqueous acetonitrile. This reaction proceeds through an initial conjugated addition of the amine to the triple bond, followed by Michael addition of H_2O to the resulting adduct, and amine elimination.[2]

Synthesis of 4-Pyrones

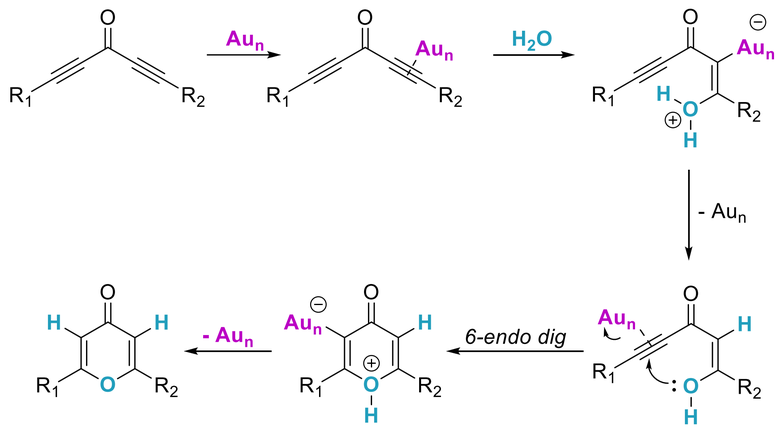
Gold Nanoparticle-Catalyzed Approach



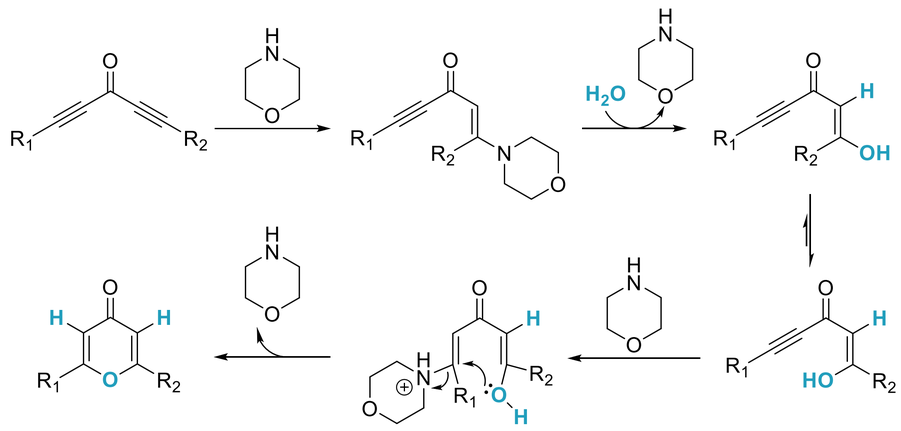
Organocatalyzed Approach



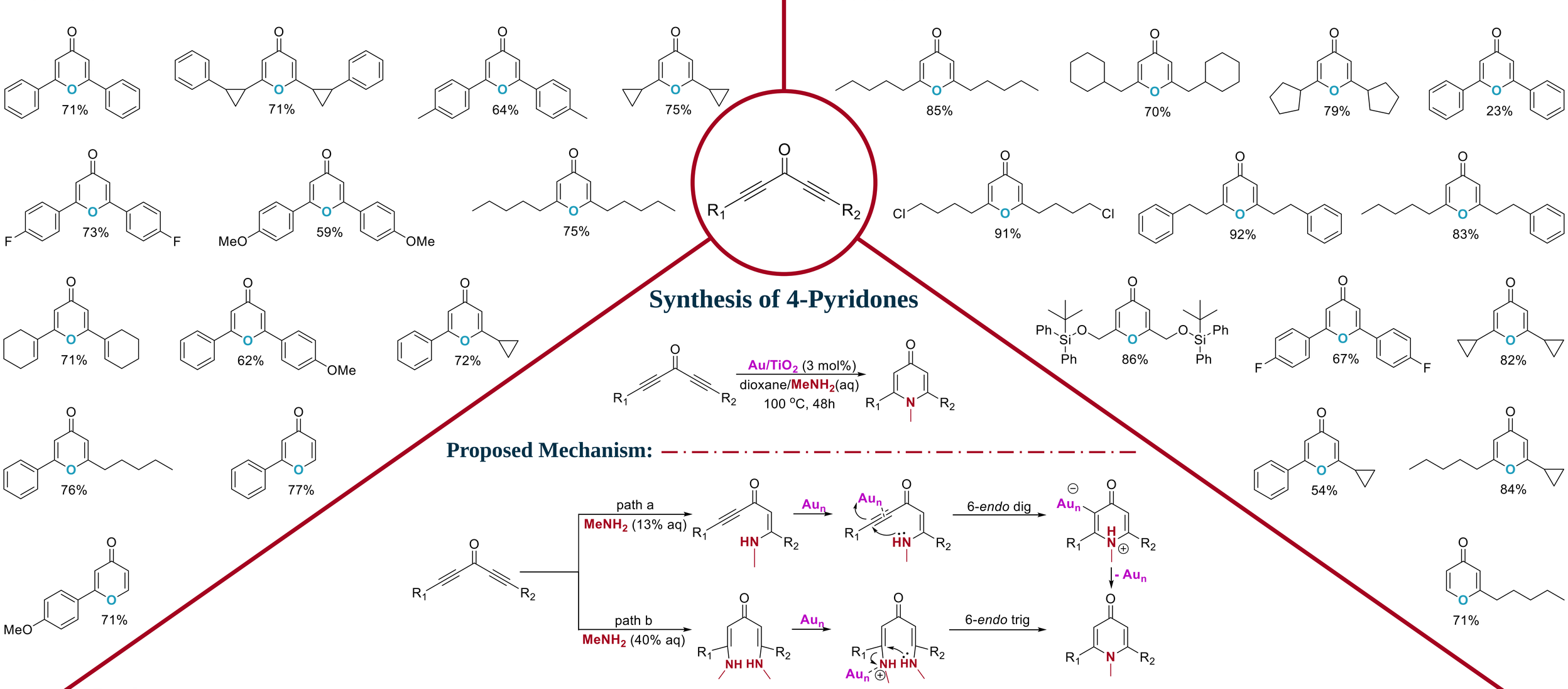
Proposed Mechanism:



Proposed Mechanism:



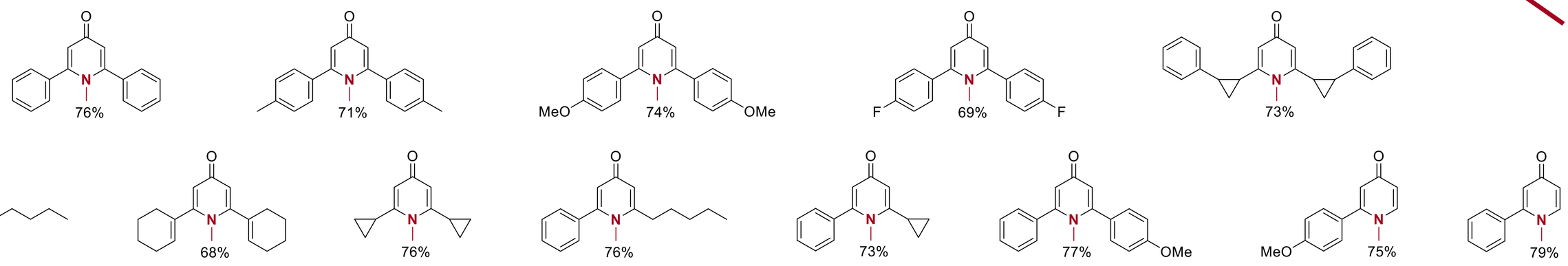
Products:



Synthesis of 4-Pyridones

Proposed Mechanism:

Products:



References: [1] Zantioti-Chatzouda, E.-M.; Kotzabasaki, V.; Stratakis, M. *J. Org. Chem.* **2022**, *87*, 8525.

[2] Zantioti-Chatzouda, E.-M.; Koromilas, N.; Kosidekakis, E.; Stratakis, M. *In preparation*.

Digital version of the poster can be found here:

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