

alkynes

cobalt catalysis

nitriles

pyridines

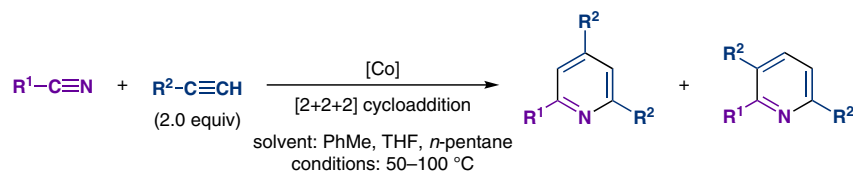
[2+2+2]
cycloadditionSynfact
Classic

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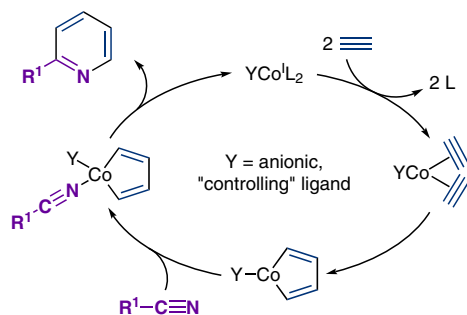
Eine einfache, kobalt-katalysierte Pyridin-Synthese

Synthesis **1974**, 575–577, DOI: 10.1055/s-1974-23379.

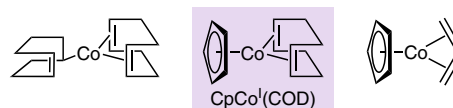
The Bönnemann–Wakatsuki Pyridine Synthesis



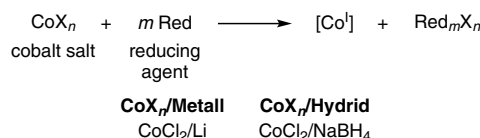
Proposed mechanism:



suitable preformed cobalt(I) catalysts-

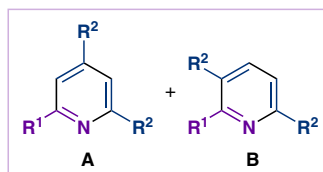


-in situ generation of the cobalt(I) catalyst-



Selected examples:

	Yield [%]	A/B
R ¹ = Me, R ² = H:	74	–
R ¹ = Me, R ² = Me:	71	61:39
R ¹ = Me, R ² = <i>n</i> -Pent:	58	69:31
R ¹ = Me, R ² = Ph:	62	80:20



	Yield [%]	A/B
R ¹ = Et, R ² = Me:	84	75:25
R ¹ = Et, R ² = Ph:	55	65:35
R ¹ = Ph, R ² = Me:	54	68:32
R ¹ = Ph, R ² = Ph:	51	77:23

Significance: In 1974, Bönnemann and co-workers reported the synthesis of pyridines from nitriles and alkynes by a cobalt(I)-catalyzed [2+2+2] cycloaddition. It should be noted that Wakatsuki and Yamazaki independently reported the same transformation using a phosphane-stabilized cobalt(III) complex (*Tetrahedron Lett.* **1973**, 36, 3383).

Comment: A series of 'ready-made' organocobalt complexes and in situ generated catalyst can be employed in this transformation. The anionic ligand Y remains attached at the cobalt center throughout the catalytic cycle, which opens the possibility to optimize the reaction by varying this 'controlling' ligand. A comprehensive structure–reactivity study was published by Bönnemann (*Angew. Chem., Int. Ed. Engl.* **1985**, 24, 248).