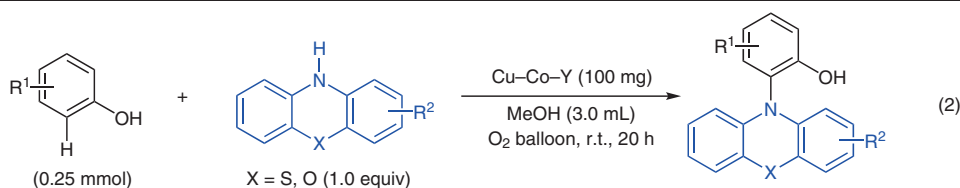
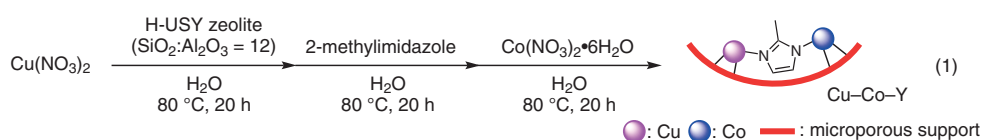


B. HUANG\*, T. LIANG\*, T. W. B. LO\*, ET AL. (THE HONG KONG POLYTECHNIC UNIVERSITY, SHENZHEN AND HONG KONG, AND GUANGXI UNIVERSITY, NANNING, P. R. OF CHINA)

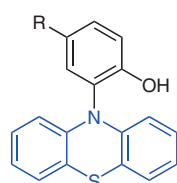
Cu–Co Dual-Atom Catalysts Supported on Hierarchical USY Zeolites for an Efficient Cross-Dehydrogenative C(sp<sup>2</sup>)–N Coupling Reaction

*J. Am. Chem. Soc.* **2023**, *145*, 8464–8473, DOI: 10.1021/jacs.3c00114.

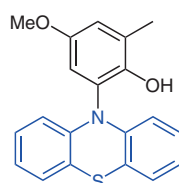
## Cross-Dehydrogenative C(sp<sup>2</sup>)–N Coupling by a Cu–Co Dual-Atom Catalyst Supported on Hierarchical Zeolite



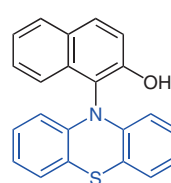
### Results:



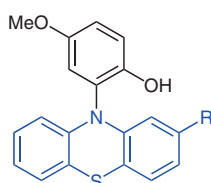
R = OMe: 81% yield  
R = OPh: 50% yield  
R = OBn: 68% yield  
R = H: 100% (*o*–*p*–*o*, *p*–*p*–*o*)



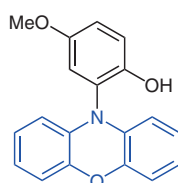
69% yield



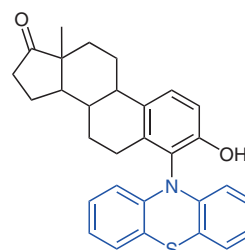
73% yield



R = CF<sub>3</sub>: 79% yield  
R = Cl: 80% yield  
R = CN: 73% yield



82% yield



n.d.

**Significance:** A copper–cobalt dual-atom catalyst supported on hierarchical USY zeolites (Cu–Co–Y), prepared according to eq. 1, promoted the cross-dehydrogenative coupling of unprotected phenols with phenothiazines and phenoxazine under an O<sub>2</sub> atmosphere to give the corresponding C–N-coupled products in up to 82% yield (eq. 2).

**Comment:** Cu–Co–Y was characterized by means of N<sub>2</sub> adsorption-desorption isotherm, XRF, MALDI-TOF/TOF-MS, SXRD, TEM, EDX, UV/Vis, XPS, and XANES analyses. In the reaction of 4-methoxyphenol with phenothiazine, the catalyst was recovered and reused four times with gradual loss of its catalytic activity (fresh: 81%, 6th run: 65%).

**SYNFACTS Contributors:** Yasuhiro Uozumi, Teruki Takahashi  
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Category

Polymer-Supported Synthesis

Key words

copper catalysis  
zeolite

cross-dehydrogenative coupling

phenols

phenothiazines

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