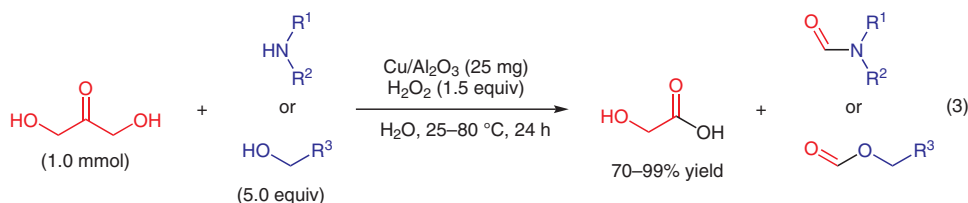
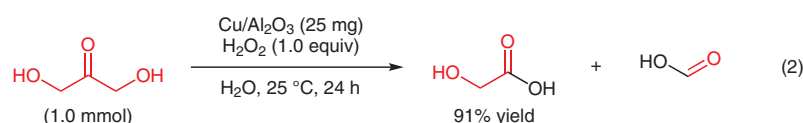
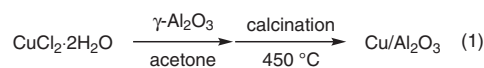


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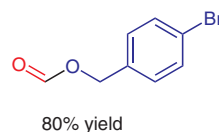
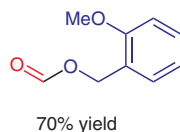
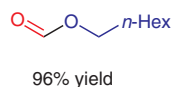
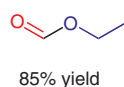
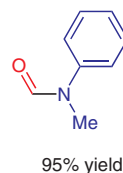
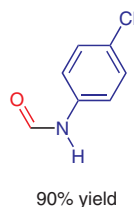
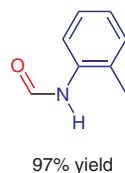
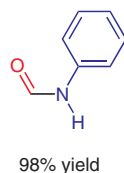
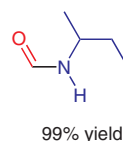
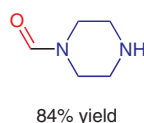
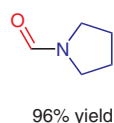
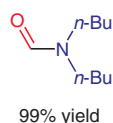
Sustainable Co-Synthesis of Glycolic Acid, Formamides and Formates from 1,3-Dihydroxyacetone by a Cu/Al<sub>2</sub>O<sub>3</sub> Catalyst with a Single Active Sites

Angew. Chem. Int. Ed. 2019, 58, 5251–5255.

## Co-Synthesis of Glycolic Acids, Formamides, and Formates on Copper/Alumina



### Selected examples:



**Significance:** An alumina-supported copper catalyst (Cu/Al<sub>2</sub>O<sub>3</sub>) was prepared by mixing copper(II) chloride with alumina, followed by calcination (eq. 1). Cu/Al<sub>2</sub>O<sub>3</sub> catalyzed the oxidative degradation of 1,3-dihydroxyacetone with hydrogen peroxide in water to give glycolic acid in 91% yield with co-production of formic acid (eq. 2). The reaction also proceeded in the presence of amines or alcohols to afford the corresponding formamides or formates as co-products in 70–99% yield (eq. 3).

**Comment:** In the oxidation of 1,3-dihydroxyacetone, Cu/Al<sub>2</sub>O<sub>3</sub> was recovered by centrifugation and reused twice without loss of its catalytic performance (fresh: 91% yield; third run: 88%). ICP analyses and a filtration test suggested that the reaction proceeds heterogeneously. XRD, HAADF-STEM, and N<sub>2</sub> adsorption–desorption experiments on the reused catalyst showed no obvious changes in its structure.

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