

Single-Atom Zinc-Catalyzed C/N-Alkylation through Borrowing Hydrogen Processes

Category

Polymer-Supported Synthesis

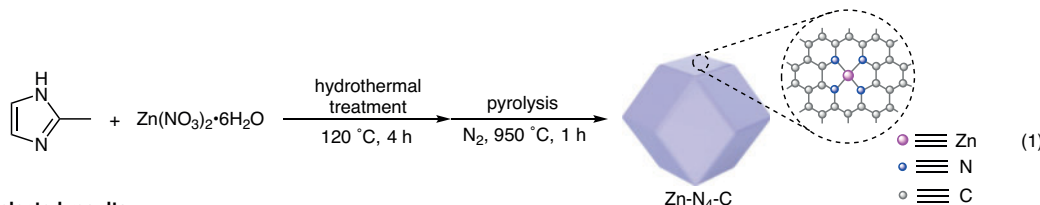
Key words

single-atom catalyst

zinc

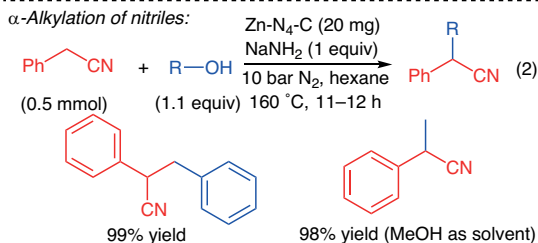
C/N-alkylation

borrowing hydrogen

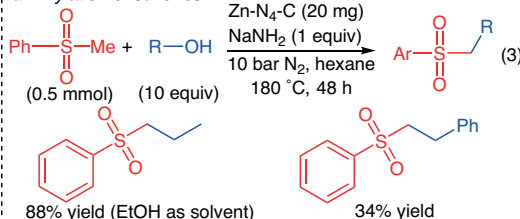


Selected results:

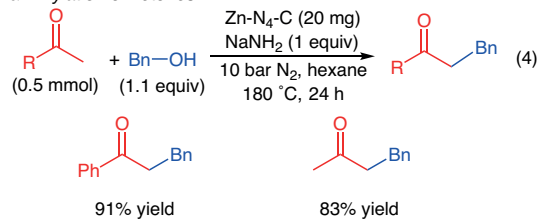
α -Alkylation of nitriles:



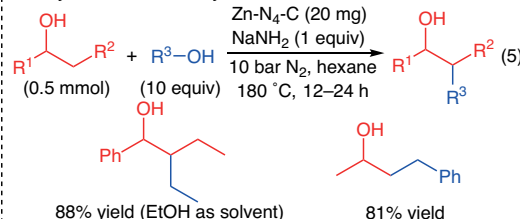
α -Alkylation of sulfones:



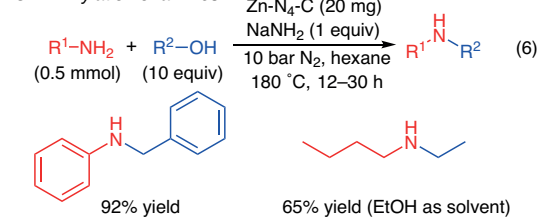
α -Alkylation of ketones:



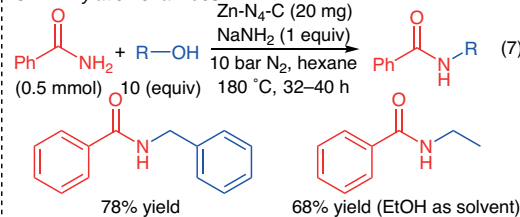
α -Alkylation of secondary alcohols:



C-N Alkylation of amines:



C-N Alkylation of amides:



Significance: Nitrogen-doped carbon-supported single-atom zinc ($\text{Zn-N}_4\text{-C}$), prepared according to equation 1, catalyzed the α -alkylation of nitriles, sulfones, ketones or secondary alcohols with alcohols as alkylating agents in the presence of NaNH_2 under 10 bar nitrogen to give the corresponding α -alkylated products in $\leq 99\%$ yield (eqs. 2–5).

Comment: The catalyst also promoted the N-alkylation of amines or amides with alcohols under similar conditions, affording the corresponding N-alkylated products (eqs. 6 and 7). In the α -alkylation of phenyl acetonitrile with benzyl alcohol, the catalyst was reused five times without a significant loss of its catalytic activity. A hot-filtration experiment demonstrated the heterogeneity of the alkylation.