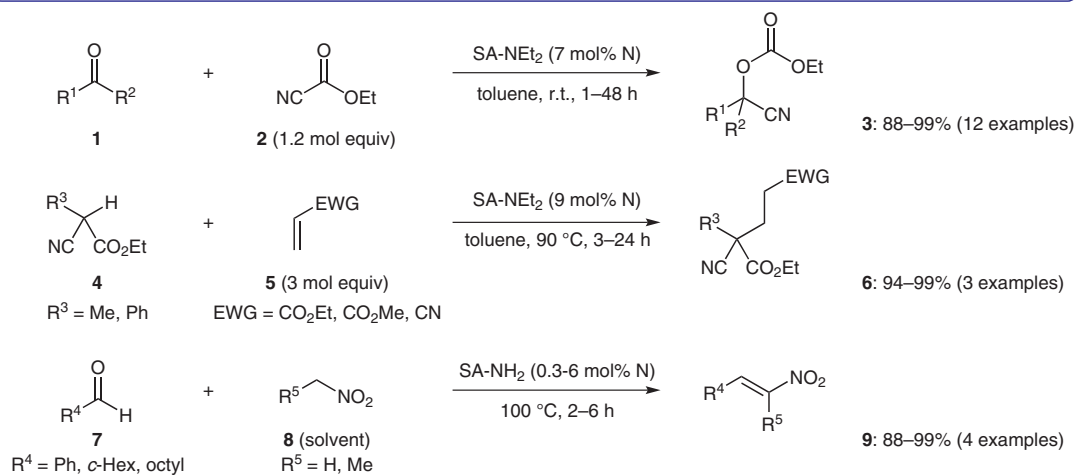
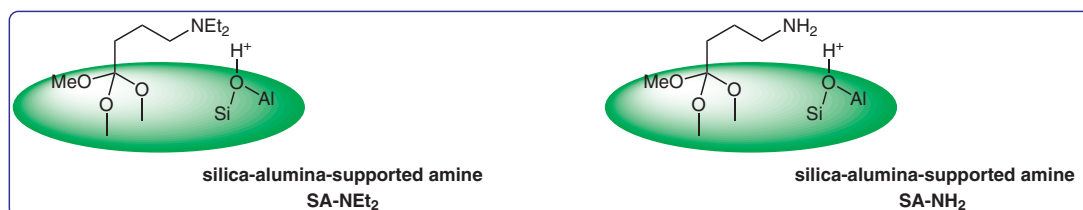


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Acid-Base Bifunctional Catalysis of Silica-Alumina-Supported Organic Amines for Carbon–Carbon Bond-Forming Reactions

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# Silica-Alumina-Supported Amine Catalysts for C–C Bond Formations



**Significance:** Acid-base bifunctional silica-alumina-supported amine catalysts (SA-NEt<sub>2</sub> and SA-NH<sub>2</sub>) were prepared and applied to the carbon–carbon bond-forming reactions. Thus, SA-NEt<sub>2</sub> was prepared from an amorphous silica-alumina (SA) N633HN (SiO<sub>2</sub>: 66.5%; Al<sub>2</sub>O<sub>3</sub>: 25.1%; 380 m<sup>2</sup>g<sup>-1</sup>) and 3-(diethylamino)propyl trimethoxysilane in toluene under reflux conditions. The cyanoethoxycarbonylation of **1** with **2** was catalyzed by SA-NEt<sub>2</sub> to give the corresponding carbonates **3** in 88–99% yield (12 examples). The Michael reaction of **4** and **5** was performed with SA-NEt<sub>2</sub> to give the corresponding adducts **6** in 94–99% yield (3 examples). SA-NH<sub>2</sub>-promoted the nitroaldol reaction of **7** and **8** to afford the nitroalkenes **9** in 88–99% yield (4 examples).

**Comment:** SA-NEt<sub>2</sub> and SA-NH<sub>2</sub> were reused four times without loss of catalytic activity in Michael and nitroaldol reactions. <sup>1</sup>H NMR spectroscopic analysis of the filtrate of the reaction mixture showed no leaching of amine compounds. SA-NEt<sub>2</sub> and SA-NH<sub>2</sub> were characterized by solid-state <sup>13</sup>C and <sup>29</sup>Si NMR spectroscopy, FT-IR spectroscopy, and elemental analysis. The authors emphasized that the co-existence of acidic and basic sites at the same solid surface without neutralization realized the catalyses with high efficiency.

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