Catalytic Asymmetric \( \alpha \)-Alkylation of Aldehydes via an \( S_N^2 \)\(^{\ddagger} \)-Type Addition–Elimination Pathway


**Significance:** A catalytic asymmetric \( \alpha \)-alkylation of aldehydes with allylic bromides 3, proceeding via an \( S_N^2 \)\(^{\ddagger} \)-type conjugate addition–elimination pathway, has been reported. Stoichiometric DMAP and catalytic amounts of secondary amine 1 delivered alkylation products 4 in moderate yields with high enantioselectivity. Using a more complex electrophile 6, product 7 was obtained with excellent enantioselectivity albeit in only 40% yield after three days. In addition to moderate yields, the main drawback of the reported method is the use of three equivalents of the aldehyde.

**Comment:** The widely pursued catalytic asymmetric \( \alpha \)-alkylation of aldehydes has recently been advanced by using secondary amine catalysis via an intramolecular \( S_N^2 \) pathway, an intermolecular radical pathway, and also via \( S_N^1 \)-type reactions. However, limitations of available methods with respect to suitable electrophiles prompted further research. In the current paper, Palomo and co-workers designed a system that circumvents catalyst alkylation probably by making it reversible. The crucial step of the reaction is based on a conjugate addition (\( A + B \rightarrow C \)) rather than on a direct alkylation. DMAP serves a dual role: activating the electrophile via intermediate B (for example, see: Y.-C. Chen et al. Angew. Chem. Int. Ed. 2009, 48, 5737) and acting as a base to remove the liberated acid.