Organocatalyzed Electroorganic Synthesis

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An overarching theme of our research program is the merger of electroorganic chemistry with organocatalysis to achieve highly efficient and sustainable methods in organic synthesis. Our first advancement in this area used N-heterocyclic carbene (NHC) catalysts and accomplished a mild, one-pot anodic oxidation of aldehydes to esters producing only H₂ gas as a byproduct (i.e., the reaction is self-sufficient, requiring no sacrificial oxidant). Our continued efforts will help determine the extent to which organocatalysis can be used to generate useful electroauxiliaries in situ for catalyzed electrolyses.

Broad substrate scope



Self-sufficient electrolyses



In general, good to high yields were obtained from both electron-rich and electron-poor aldehydes, excellent chemoselectivity was observed, and heteroaromatic aldehydes were tolerated. Oxidation of nonaromatic aldehydes also proceeded smoothly. Further development of our aldehyde oxidations has the potential to achieve highly efficient syntheses of lactones, thioesters, amides, and ketones.