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From Breaking Bonds to Bonding to Boats. Using Green Chemistry to Access New Adhesives for CO2 Mitigation in the Shipping Industry

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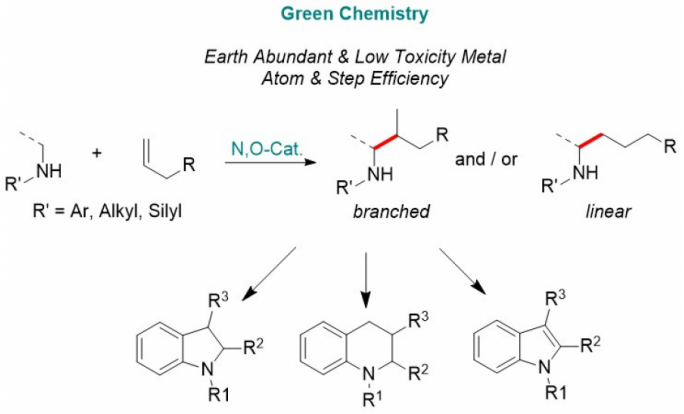
PURPOSE OF THE ABSTRACT

The development of a general catalyst for the catalytic synthesis of selectively substituted amines from amines and alkenes has been realized. It proceeds by C-C bond formation, rather than C-N bond formation, via the hydroaminoalkylation reaction.[1] Hydroaminoalkylation is an alkene hydrofunctionalization reaction that adds an activated Csp3-H bond ?-to N across an alkene to generate a new Csp3 - Csp3 bond (Figure 1). This solvent-free reaction can be completed on multigram scale and avoids the installation of amine protecting/directing groups. This reaction, that can be mediated by the 3d and abundant transition metal titanium, affords a new strategy for the assembly of amines from abundant feedstocks while adhering to the principles of Green Chemistry. N,O-chelated early transition metals, with their modular and tunable ligand framework, are the leading catalyst systems for this desirable transformation. By taking advantage of this easily varied catalyst system a broad range of amines and N-heterocycles, as well as both terminal and internal alkenes, can be used to prepare selectively substituted secondary and primary amines. These catalysts, with TONs up to >200 h, can be used in materials chemistry applications to access new classes of aminated materials (Figure 2).[2,3] The resultant materials show remarkable self-healing and adhesion properties that present opportunities for application in the development of low-surface-energy marine coatings that resist fouling and decrease drag. This talk will describe how fundamental questions in bond activation and catalysis can be leveraged to realize applications in materials science that could reduce global CO2 emissions.

FIGURES



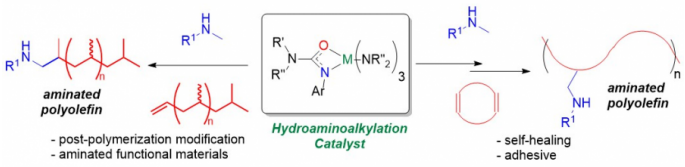


FIGURE 1

Figure 1.

Regioselective, catalytic hydroaminoalkylation as a key step in the synthesis of selectively substituted amines and N-heterocycles.

FIGURE 2

Figure 2.

N,O-chelated early transition metal catalysts for functional materials synthesis.

KEYWORDS

hydroaminoalkylation | amine synthesis | catalysis | functional materials

BIBLIOGRAPHY