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TOPIC(s) : Biomass conversion

Synthesis of THF-derived Amines by Transformation of Bio-derived Furfural

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PURPOSE OF THE ABSTRACT

The transformation of biomass into valuable amines is highly desirable in view of the synthesis of biosolvents and biosurfactants. As of today, only few amination studies have been reported on biobased substrates, targeting mainly the reductive amination of small platform molecules issued directly from biomass. For instance, furfural, derived from the hydrolysis of xylose, can be selectively converted into furfurylamine over supported ruthenium catalysts.^{1,2} To increase the molecular complexity and diversity of biobased amines, it is necessary to develop catalytic processes combining C-C and C-N coupling reactions. One option could be the combination of the aldol condensation reaction of furfural with ketones which contain variable chain length and ramification degree (e.g., methyl isobutyl ketone or MIBK), followed by reductive amination (Scheme 1-route A). The aldol condensation of furanic compounds has been reported so far, but targeting mainly the production of liquid alkanes.³

Herein we report the preparation of a new family of THF-derived amines with high selectivity, starting from bio-derived ketones issued from the aldol condensation of furfural with MIBK and using NH₃ or amines as nitrogen source and H₂ as reducing agent. By combining the basic Amberlyst-26 (catalyst 1) with 5%Pd/Al₂O₃ (catalyst 2), functionalized THF-derived amines could be directly accessed from furfural in a single reactor (one-reactor tandem concept) without need of isolating the aldol intermediate (Scheme 1- route B). Using this approach, a high yield (74%) of THF-derived primary amines could be achieved starting directly from biomass-derived furfural.

FIGURES

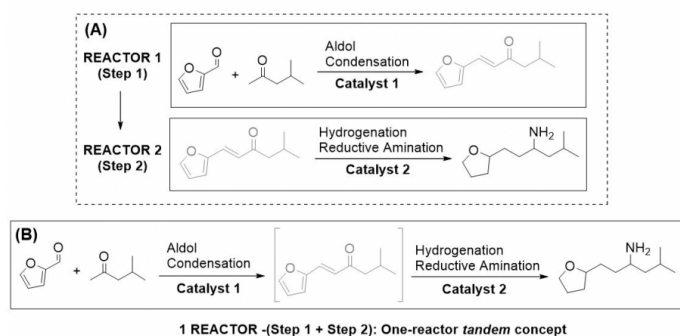


FIGURE 1

Figure 1.

(A) Two-reactor process for the synthesis of furfural- and THF-derived amines by combining aldol condensation (C-C) and reductive amination (C-N); (B) one-reactor tandem concept.

FIGURE 2

KEYWORDS

BIBLIOGRAPHY

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