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Production of N-Vinyl-Pyrrolidones from Bio-Based Carboxylic Acids

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PURPOSE OF THE ABSTRACT
Pyrrolidones are an interesting class of N-containing fine chemicals, which offer a wide range of applications as polymers or solvents in several industries. Currently they are mainly produced from petrochemical resources using multi step processes which are cost intensive and atom inefficient. [1]
Biomass is an alternative feedstock which can replace fossil resources as a renewable carbon feedstock for the chemical industry. In this context biomass derived carboxylic acids such as levulinic, succinic and itaconic acid are platform chemicals with a high potential for further valorization. [2] Different companies already revealed the possibility to produce those chemicals in demonstration plants using bio- or chemically catalyzed processes. The production of pyrrolidones from carboxylic acids has been described in several articles, dealing mostly with the synthesis of N-substituted pyrrolidones as pharmaceutical intermediates. [3]
We present an approach to convert carboxylic acids, such as itaconic acid, into N-unsubstituted 2-pyrrolidones using a heterogeneous catalyst, ammonia and hydrogen. [4] Furthermore we demonstrate the vinylation of these bio-based pyrrolidones to produce N-vinyl-pyrrolidones.

FIGURES

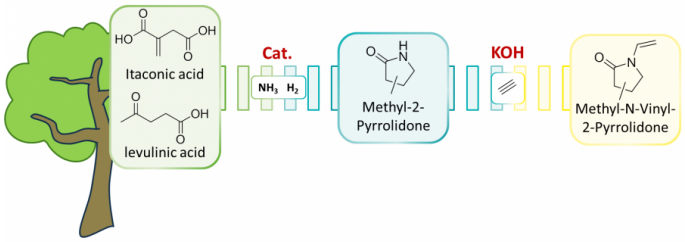

FIGURE 1

Schematic 2-Step Synthesis of N-Vinyl-Pyrrolidones.
Conversion of itaconic and levulinic acid into methyl-2-pyrrolidones followed by vinylation with acetylene to access N-vinyl-pyrrolidones.

FIGURE 2

KEYWORDS

Pyrrolidones | Itaconic Acid | Heterogeneous Catalysis | Monomers

BIBLIOGRAPHY

[1] Ullmann's Encyclopedia of Industrial Chemistry, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany, 2005.
[2] T. A. Werpy, J. E. Holladay, J. F. White, Top Value Added Chemicals From Biomass. I. Results of Screening for Potential Candidates from Sugars and Synthesis Gas, 2004.
[3] X.-L. Du, L. He, S. Zhao, Y.-M. Liu, Y. Cao, H.-Y. He, K.-N. Fan, Angew. Chem. 2011, 123, 7961.
[4] Y. Louven, K. Schute, R. Palkovits, ChemCatChem 2018, 6, 74.