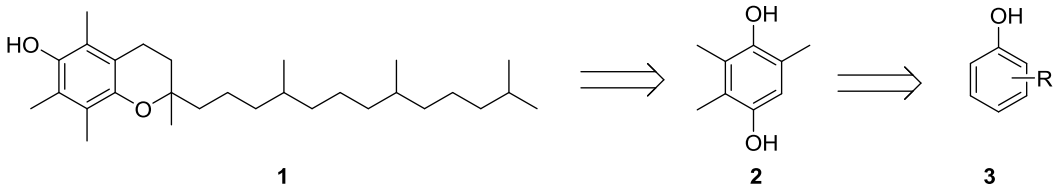
Bio-Based Aromatic Building Blocks for Vitamin E Manufacture

Ulla Létinois, Thomas Netscher, Werner Bonrath

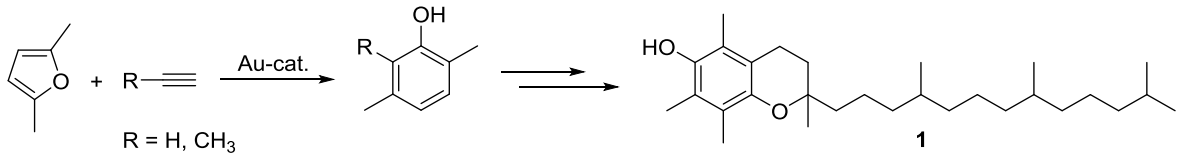
Research and Development, DSM Nutritional Products,
P.O. Box 2676, 4002 Basel, Switzerland; ulla.letinois@dsm.com

Strategies for mitigation of greenhouse gas emissions include significant reduction of fossil resource consumption in the field of energy supply and chemical production. In chemical industry more environmentally friendly manufacturing alternatives are therefore required.

Synthetic vitamin E, the industrially most important antioxidant for feed, food and pharma applications, is currently produced from the fossil resources m-cresol, acetylene, methanol and acetone[1] on a scale of >30'000 tons per year worldwide. For manufacture of **1** via 2,3,5-trimethylhydroquinone (**2**) we were interested in phenols (**3**) from renewable resources[2] having an appropriate substitution pattern.



Hashmi's gold-catalyzed furan-yne-cycloisomerization reaction[3] starts from furans which are available from renewable resources[4] and yield phenols. We reasoned that intermolecular reactions between 2,5-dimethylfuran and small, gaseous alkynes should give access to desired dimethyl or trimethyl phenols. To the best of our knowledge, no such bio-based route to aromatic building blocks for vitamin E synthesis was known so far.



In the present contribution, the new synthesis of α-tocopherol based on the key transformation of furans with acetylene and propyne will be discussed[5] as well as the determination of the eco footprint for both processes.

[1] M. Eggersdorfer, D. Laudert, U. Létinois, T. McClymont, J. Medlock, T. Netscher, W. Bonrath, *Angew. Chem. Int. Ed.* **2012**, *51*, 12960–12990.
[2] E. de Jong, A. Higson, P. Walsh, M. Wellisch, International Energy Agency, Report IEA Bioenergy Task 42, **2012.**
[3] A. Zeiler, M. J. Ziegler, M. Rudolph, F. Rominger, A. S. K. Hashmi, *Adv. Synth. Catal.* **2015**, *357*, 1507–1514 and references cited therein.
[4] Y. Román-Leshkov, C. J. Barrett, Z. Y. Liu, J. A. Dumesic, *Nature* **2007**, *447*, 982–985.
[5] W. Bonrath, U. Letinois, T. Netscher, *WO 2015110655*, **2015**; W. Bonrath, U. Letinois, T. Netscher, *WO 2015110654*, **2015**.