From carbohydrates to furan based building blocks

Carlos A. M. Afonso

Faculty of Pharmacy, University of Lisbon, Av. Prof. Gama pinto, 1649-003 Lisbon, Portugal; e-mail: carlosafonso@ff.ul.pt

The reduction of fossil resources for energy consumption and platform chemicals for different purposes will shift gradually to biorenewable resources such as intensive biotransformation processes or functional transformations of existing resources that do not compete with other important needs such as cellulose, lignin waste products and other polysaccharides.[1] Several building blocks derived from renewable resources such as ethanol, glycerol, lactic acid, furfural, succinic acid, levulinic acid, are already in use or considered with potential importance in the near future.[2] Among them, 5-hydroxymethyl-furfural (HMF) has been considered a very promising intermediate building block due to its potential rich chemistry that allows different transformations such as to biofuels (dimethylfuran), polymer monomers (2,5-diformylfuran and 2,5-furandicarboxyllic acid), levulinic acid, adipic acid, caprolactam and caprolactone and many other more specific molecules,[2b, 3] including active pharmaceutical ingredients.[4] In line with our interest in the valorization of natural resources will be described recent achievements from this laboratory on the production of carbohydrates to 5‑hydroxymethylfurfural (HMF), transformation of HMF to several building blocks, biological activity and selection guidelines for human exposure of furfural-related compounds.[5]

[1] G. W. Huber, S. Iborra, A. Corma, *Chemical Reviews* **2006,** *106*, 4044-4098.
[2] P. Gallezot, *Chem. Soc. Rev.*, **2012,** *41*, 1538-1558; b) A. Corma, S. Iborra, A. Velty, *Chemical Reviews* **2007,** *107*, 2411-2502.
[3] a) T. Stahlberg, W. J. Fu, J. M. Woodley, A. Riisager, *Chemsuschem* **2011,** *4*, 451-458; b) A. A. Rosatella, S. P. Simeonov, R. F. M. Frade, C. A. M. Afonso, *Green Chemistry* **2011,** *13*, 754-793; c) R. J van Putten, J. C. van der Waal, Ed de Jong, C. B. Rasrendra, H. J. Heeres,and J.G. de Vries, *Chem. Rev.* **2013,** *113*, 1499.
[4] M. Mascal, S. Dutta, *Green Chemistry* **2011,** *13*, 3101-3102.
[5] S. P. Simeonov, J. A. S. Coelho, C. A. M. Afonso, *ChemSusChem*, **2013,** *6*, 997-1000; Sowmiah Subbiah, Svilen P. Simeonov, José M. S. S. Esperança, Luís Paulo N. Rebelo, Carlos A. M. Afonso, *Green Chem.*, **2013,** *15*, 2849–2853; R. F. M. Frade, J. A. S. Coelho, S. P. Simeonov, C. A. M. Afonso *Toxicol. Res.*, **2014**, *3*, 311-314

Acknowledgment: FCT for financial support

Biography

Carlos A. M. Afonso (born in 1962) is currently Full Professor at Faculty of Pharmacy, University of Lisbon, Portugal. He received his Ph.D. in 1990 under the supervision of Professor Christopher Maycock, subsequently became Assistant Professor at New University of Lisbon and Associate Professor at the Instituto Superior Técnico (2004-2010), and took a postdoctoral fellow (1990) at the Imperial College of Science Technology and Medicine (W. B. Motherwell) and sabbatical leave (1997/1998) at University of Bath, UK (Jonathan Williams) and at the University of Toronto (Robert Batey). Is co-author of around 170 papers and his research laboratory focuses on the development of new non-asymmetric and asymmetric synthetic methodologies, organic reactions mechanisms, development and applications of new ionic liquids and green chemistry.