Insight Medical Publishing

Archives in Chemical Research

ISSN 2572-4657

2020

Vol.4 No.5

Immobilization of Candida Antarctica lipase B in a silicified hydrogel support and its application as bioreactor

Rudina Bleta, Cedric Decarpigny, Anne Ponchel and Eric Monflier

Unité de Catalyse et Chimie du Solide (UCCS), Artois University, France

Abstract

Supramolecular hydrogels have attracted increasing interest in recent years because of their ability to incorporate high levels of proteins, cells, antibodies, peptides and genes. In this work, we propose a new approach to confinement of Candida Antarctica lipase B (CALB) within a supramolecular silicified hydrogel based on Pluronic F127 and α-cyclodextrin (α-CD). After functionalization of the matrix, the catalytic performance of the supported biocatalyst was evaluated in the oxidation of 2,5-diformylfuran (DFF) to 2,5-furandicarboxylic acid (FDCA), a fully biosourced alternative to terephthalic acid used in the production of polyethylene terephthalate (PET). Our results revealed that while CALB immobilized in conventional sol-gel silica yielded exclusively 5-formylfuran-2-carboxylic acid (FFCA), confinement of the enzyme in the silicified hydrogel imparted a 5-fold increase in DFF conversion and afforded 67% FDCA yield in 7 h and almost quantitative yields in less than 24 h. The hierarchically interconnected pore structure of the host matrix was found to provide a readily accessible diffusion path for reactants and products, while its flexible hydrophilic-hydrophobic interface was extremely beneficial for the interfacial activation of the immobilized lipase.

Biography:

Dr. Bleta has completed her PhD from Nancy University and postdoctoral studies from University Paul Sabatier at the CIRIMAT-Carnot Institute in Toulouse. In 2012, she joined the Professor Monflier's team at the UCCS-Artois as a lecturer. Her research expertise consists in developing new synthesis approaches, especially from soft chemistry routes, to design novel nanostructured porous materials, with a specific focus on the development of heterogeneous catalysts for environmental and sustainable energy applications.

Speaker Publications:

1. "Confinement of Candida Antarctica Lipase B in a Multifunctional Cyclodextrin-Derived Silicified Hydrogel and Its Application as Enzymatic Nanoreactor" Journal of Applied Bio Materials, Vol-12, Issue 2, pg-5568–5581, 2019

2. "Cyclodextrin-based supramolecular assemblies: a versatile toolbox for the preparation of functional porous materials" Issue-16, pages1393–1413(2018), June Environmental Chemistry Letters

3. "Cyclodextrins and Nanostructured Porous Inorganic Materials" Environmental Chemistry for a Sustainable World; 27 April 2018, pp 105-153

4." Robust Mesoporous CoMo/γ-Al2O3Catalysts from Cyclodextrin-Based Supramolecular Assemblies for Hydrothermal Processing of Microalgae: Effect of the Preparation Method"Journal of Applied Materials & Interfaces,vol-10, Isuue-15, 2018

5." Cyclodextrin-cobalt (II) molecule-ion pairs as precursors to active Co3O4/ZrO2 catalysts for the complete oxidation of formaldehyde: Influence of the cobalt source" Journal of Catalysis, vol-341,pg-191-204, 2016

7th World Congress on Chemical Engineering and Catalysis Webinar– July 22-23, 2020.

Abstract Citation:

Rudina Bleta, Immobilization of Candida Antarctica lipase B in a silicified hydrogel support and its application as bioreactor, Chemical Engineering Congress 2020, 7th World Congress on Chemical Engineering and Catalysis, Webinar July 22- 23, 2020.

(https://chemicalengineering.annualcongress.com/abstract/2020/immobilization-of-candida-antarctica-lipase-b-in-a-silicified-hydrogel-support-and-its-application-as-bioreactor)