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SA metrics- Comparative sustainability metrics for biomass and petrochemical succinic acid production and its catalytic valorization into ϒ-butyrolactone

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A wide range of renewable raw materials and compounds can be obtained from lignocellulosic biomass and their derivatives. One of these compounds is biomass-derived Succinic Acid (Bio-SA) which has been described as a strategic platform chemical, due to its potential as the C4 building block in industrial organic chemistry. Sustainability of SA production via fermentative synthesis was studied through two different processes (Myriant and Reverdia cases) and compared with the petrochemical route. Four groups of parameters, namely material efficiency, economics, energy efficiency and land use were considered for this green approach. Metrics calculations show that energy efficiency for Bio-SA production is slig3htly higher while material efficiency is rather lower when compared with the petrochemical counterpart (Ptr.SA). Remarkably, Bio-SA calculated costs (even in the worse case) are quite lower than the prices for Petr.SA and close to the price of maleic anhydride (MAN) used as raw material. Thus, bio-based SA production appears to be competitive with petrochemical route for MAN, this representing an economic advantage and an opportunity for decreasing of fossil oil dependency. Competitiveness of Bio-SA can be boosted by optimization of fermentative process, as well as by the transformation of Bio-SA into high added value chemicals, such as γ-butyrolactone (GBL). Following this idea, the use of Pd/Al2O3 as a promising and relatively cheap catalyst for the one-pot synthesis of GBL from Bio-SA (or its anhydride) under mild reaction conditions will be presented as affordable alternative for Bio-SA chemical upgrading.

Biography

Marcelo E Domine completed his PhD at the Polytechnic University of Valencia (Spain) in 2003 under the guidance of Prof. A. Corma, and Postdoctoral studies at the IRCELYON Institute of CNRS (France, 2005-07). In 2008, he re-joined the Institute of Chemical Technology of Valencia (UPV-CSIC, Spain) as Scientific Researcher of CSIC.His current research involves the synthesis and characterization of solid catalysts and their application in sustainable chemical processes; mainly focusing on new biomass-derivatives transformations into valuable chemicals. He is co-author of 35 publications and more than 20 patent applications. He has presented over 10 invited conferences around the world. He currently is Guest Managing Editor of Catalysis Today, also acting as Reviewer in many renowned scientific journals in catalysis and fuels areas.

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