References and Further Reading

Chemical manufacturing methods for the 21st century pharmaceutical industries (CHEM21)

Funded by : European Union/GlaxoSmithKline

Europe's largest public-private partnership dedicated to the development of manufacturing sustainable pharmaceuticals.

The CHEM 21 online platform has now been launched and has a permanent URL http://learning.chem21.eu/

In the synthetic toolbox section, there is material on biocatalysts and synthetic biology. This resource is all free to access, download etc and use for non-profit activities.

Biocatalysis

- Industrial Biocatalysis 2nd Edition Wiley 2006 ISBN: 978-3-527-31001-2
- Engineering the third wave of Biocatalysis, Nature 2012, 485, 185–194
- On the development of new biocatalytic processes for practical pharmaceutical synthesis. Curr. Opin. Chem. Biol. 2013, 17,1–9
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- Discovery and Protein Engineering of Biocatalysts for Organic Synthesis. Adv. Synth. Catal. 2011, 353, 2191–2215
- Biocatalysis in Organic Chemistry and Biotechnology: Past, Present, and Future. J. Am. Chem. Soc. 2013, 135, 12480−12496

Process Chamistry and Route Selection

- The Eight Criteria Defining a Good Chemical Manufacturing Process. Org. Process Res. Dev. 2012, 16 (11), 1697–1706
- Critical Assessment of Pharmaceutical Processes; A Rationale for Changing the Synthetic Route Chem. Rev. 2006, 106, 3002-3027
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- Holistic Route Selection Organic Process Research & Development 2012, 16 (3), pp 415–424
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Industrial Example 1 : Further Reading

Pregabalin (LyricaTM) , myristyl myristate, Pen G(Penicillin anti-biotics)

- The Development of a Green, Energy Efficient, Chemoenzymatic Manufacturing Process for Pregabalin Chapter 8, Green Chemistry in the Pharmaceutical Industry, Wiley- VCH, 2010. Print ISBN: 9783527324187
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- Immobilised lipases in the cosmetics industry Chemical Society Reviews 2013, 42, 6475-6490
- A Sustainable Method for the Production of Emollient Esters SÖFW-Journal | 134 | 1/2-2008 p44
- Integrating Natural, Sustainable and Performance Characteristics in Personal Care Products SÖFW-Journal SOFW-Journal | 136 | 9-2010 p36
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- Biocatalysis for Sustainable Organic Synthesis Aust. J.Chem. 2004,57,281-289
- Biocatalysts and Enzyme Technology. K. Buchholz, V. Kasche, U.T. Bornscheuer Copyright © 2005 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim. ISBN: 3-527-30497-5

INDUSTRIAL EXAMPLE 2

Januvia (SitagliptinTM)

- Synthesis of Sitagliptin, the Active Ingredient in Januvia® and Janumet®. Chapter 5, Green Chemistry in the Pharmaceutical Industry, Wiley- VCH, 2010. Print ISBN: 9783527324187
- First Generation Process for the Preparation of the DPV-IV Inhibitor Org. Process Res. Dev., 2005, 9, 634-639
- Highly Efficient Asymmetric Synthesis of Sitagliptin, Journal of the American Chemical Society, 2009, 131, 8798-8804
- Biocatalytic Asymmetric Synthesis of Chiral Amines from Ketones Applied to Sitagliptin Manufacture, Science, 2010, 239, 306-309
- ω-Transaminases for the Production of Optically Pure Amines and Unnatural Amino Acids ACS Catal., 2012, 2 , 993–1001
- Sitagliptin Manufacture: A Compelling Tale of Green Chemistry, Process Intensification, and Industrial Asymmetric Catalysis Angew. Chem. Int. Ed. 2011, 50, 2–5
- Transaminases for the synthesis of non-racemic a-chiral primary amines Trends in Biotechnology 28 (2010) 324–332

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