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Sustainable synthesis via the integration of membranes in chemical reactions**Dominic Ormerod, Matthieu Dorbec, Wim Porto Carrero, Anita Buekenhoudt, Karlien Duyssens and Pieter Vloemans**
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Successful chemical production of molecules whilst simultaneously reducing the environmental impact of the process relies not only on more efficient reactions but also on developments in reactor and separation technology. Recent decades have also witnessed a significant growth in industrial interest in solvent based separations using membranes stable to organic solvents. Thanks to its non-thermal, hence mild and energy-efficient character, organic solvent nanofiltration (OSN) is capable of efficiently concentrating and purifying valuable target molecules, removing post-reaction residues and recovery of spent solvents or catalysts. Furthermore, process intensification can be achieved by the integration of OSN with chemical reactions, resulting in significant gains in purity and/or capacity, and concomitant decreases in energy demand, raw material usage and/or waste volumes. One particular development deals with reactions which require, for various reasons, a high substrate dilution in order to avoid the formation of unwanted secondary products. This results in large volumes of solvent being necessary to produce relatively small quantities of the desired molecule. A typical case where such diluted conditions are required is the synthesis of macrocyclic molecules. Despite this drawback, globally several macrocyclic compounds are being produced on an industrial scale, however in a very inefficient manner. In order to address the economic and environmental shortcomings of high dilution reactions, VITO has developed a processing method that incorporates in line solvent recycling via OSN. This membrane-assisted methodology allows for significant reductions in the solvent load without loss in product yield or analytical purity as compared to a batch process. In collaboration with industrial partners, the potential of this novel methodology has been demonstrated in the preparation of numerous macrocyclic molecules.

Biography

Dominic Ormerod is a Senior Researcher in the Green Chemical Technology group at VITO, which he joined in February 2012. After obtaining a PhD in Organic Chemistry, (1998, Université Catholique de Louvain, Louvain-La-Neuve Belgium) in the group of Prof. I. E. Markó, he moved to Janssen Pharmaceutica, Beerse, Belgium in the Department of Chemical Process Development, where he worked from 1998 until January 2012. In his current role, he Leads research directed towards membrane assisted process intensification. He is the author of 14 publications and inventor on 9 patents.

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