

RECYCLING & WASTE MANAGEMENT

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Gyorgy Szekely

The University of Manchester, UK

Nanofiltration and molecular imprinting for waste utilization


Sustainable manufacturing is one of the grand challenges of the 21st century. It has recently been realized that conventional downstream separation processes are unsustainable because they can account for as much as 80% of the total manufacturing costs and eventually contribute 50% of the industrial energy usage. With profit margins growing thin, there is an imperative drive for minimizing both the cost and environmental impact via process intensification (PI). PI through minimizing solvent and raw material consumption, as well as utilizing waste, can make a significant difference towards environmentally benign and economically viable chemical production. As effective PI tools, nanofiltration and molecular imprinting technologies are getting recognized as emerging technologies that provide green process engineering. The presentation covers the development of sustainable separation processes based on nanofiltration and imprinted materials. Examples and industrial case studies for solvent recovery and recycling, yield enhancement, purity improvement, valorization of agricultural waste are discussed. Imprinted materials offer

unique separations including three-way fractionation of solutes in organic media. Synergistic coupling of imprinting and nanofiltration technologies for hybrid processes will be demonstrated. Examples will demonstrate that separation processes based on nanofiltration and molecular imprinting can reduce carbon footprint by 90% and process mass intensity by 99%.

Speaker Biography

Gyorgy Szekely received his MEng degree in Chemical Engineering from the Technical University of Budapest, and he earned his PhD degree in Chemistry under the European Commission's Marie Curie Actions from the Technical University of Dortmund. He worked as an Early Stage Researcher in Hovione PharmaScience and an IAESTE Fellow at the University of Tokyo. He was a Research Associate working with Andrew Livingston on molecular level separations in Imperial College London. He is currently a Lecturer in Chemical Engineering at The University of Manchester. His multidisciplinary professional background covers supramolecular chemistry, molecular recognition, molecular imprinting, process development, waste utilization, nanofiltration and pharmaceutical impurity scavenging. He serves as an Academic Editor for the journal *Advanced Materials Letters*, the Secretary General for the Marie Curie Fellows Association, and a Member of the Royal Society of Chemistry. He has over 40 publications including 4 patents and 4 book chapters.

e: gyorgy.szekely@manchester.ac.uk

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