

Membranes for molecular separations – A key technology for low carbon chemical manufacturing

A key driver for many current innovations throughout the chemical process industries is the need to reduce carbon emissions when manufacturing products. Carbon reduction can be achieved through applying green chemistry techniques (i.e. increase the atom efficiency of the production process and minimize waste generation) and/or through reducing energy use in separations. It has been reported in the AIChE Vision 2020:2000 Separations Roadmap that separation processes account for 40-70% of capital and operating costs in the chemical process industries¹. The main factor in the high cost of separations is the large amount of energy required for phase change, i.e. to evaporate and subsequently condense the more volatile components in a process stream in distillation/evaporation separations. Even separation techniques that do not directly involve phase change (e.g. extraction, crystallization and chromatography), require evaporation/distillation operations to concentrate the desired product and recover solvents. One of the key advantages of utilizing membranes for molecular separations is that there is no phase change during the filtration. This means that the energy requirement for a given separation is much less than the conventional process, e.g. concentrating a molecule in a dilute methanol solution by a factor of ten using membranes requires <10% of the energy of the equivalent evaporation process! This paper will discuss recent advances in the development of the DuraMem™ range of membranes for molecular separations in organic solvents and provide examples of how they can be used to provide low energy/low carbon solutions for industrial separation problems.

ⁱ <http://www.chemicalvision2020.org/pdfs/sepmap.pdf>

Bio Sketch

Dr. Andrew Boam

AB is Technical Director at Membrane Extraction Technology Ltd. (MET), with responsibility for development of applications and new membranes. AB obtained both his MEng and PhD degrees from Imperial College London. In 1996, following one year of post-doctoral work, AB was one of the founders of MET with Prof. Andrew Livingston. In his 15 years with MET, AB has been involved in the development of membrane-based technologies for both environmental and production improvements, and responsible for pilot and industrial installation of these technologies. In the last 5 years, AB's team has focussed on the development and use of organic solvent nanofiltration membranes.

AB is a co-author of 20+ refereed journal publications and articles, and is co-inventor of several patents (both granted and applied for). AB has also presented at several national and international conferences.