

166d Tools for the Fast Development of Membrane Processes

Nigel Titchener-Hooker

Membranes are widely used in the recovery and purification of biopharmaceuticals. With increasing pressures to achieve cost reduction and speed to market there is a need for companies to have the technologies necessary for the rapid and accurate evaluation of membrane processes early in the development of candidate drugs. This paper will present research arising from the Innovative Manufacturing Research Centre [IMRC] housed at University College London [UCL], which is a consortium of twelve internationally leading companies. The IMRC has pioneered the use of so-called ultra scale-down techniques by which key process parameters can be assessed rapidly using any very small quantities of material. Success in the characterisation of microfiltration operations in which it has been possible to predict flux and transmission behaviour of large scale units based upon studies employing only a few tens of millilitres of material will be presented. A membrane rig which utilises a rotating disk to generate appropriate shear conditions that mimic the cross flow environment provides the necessary scale-down device. More tantalizingly parallel work on the recovery of small molecule products is starting to pave the way for similar data to be generated using microlitre quantities of materials and this presentation will present results to demonstrate this approach also.

Central to the successful prediction of bioprocess performance is the realisation that processes must be considered in an holistic fashion were the behaviour of the individual stages comprising a process sequence all interact in an integrated fashion. Results which demonstrate the significance of understanding these interactions and of being able to quantify them on the basis of small scale experimentation will be presented. Of particular interest in the context of membrane separations is the role of filters upstream of high resolution chromatographic separations and an example which shows how the selection of primary separation stages can impact significantly on subsequent process behaviour will be given. Ultimately the results of such experiments and simulations need to be easily accessed and used. The final element of the talk therefore will consider the use of so-called “Windows of Operation” that provide a graphical method for the representation of process behaviours and for the selection of appropriate operating strategies.