Universität Duisburg-Essen
Lehrstuhl für Technische Chemie II
Prof. Dr. Mathias Ulbricht

Technisch-Chemisches Kolloquium

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14:15 Uhr

Raum T03 R02 D26 (Campus Essen)

Membranes for Bioseparations and Water Recovery

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Membrane based separations are attractive in several areas. Here two areas of significant societal impact are discussed: membrane based bioseparations, and emerging membrane processes for water recovery.

Biopharmaceutical manufacturing processes make use of cell lines to produce therapeutics such as monoclonal antibodies, fusion proteins etc. The manufacturing process is divided into upstream cell culture and downstream purification operations. Due to improvements in cell titers there is increased demand for the development of efficient downstream purification operations. Membrane based unit operations are attractive as they are easy to scale up and involve gentle processing conditions. Nevertheless, low product recovery as well as membrane fouling remain a concern.

Today, biopharmaceutical manufacturing processes are typically run in batch mode. There is a great deal of interest in developing continuous biomanufacturing processes in order to minimize batch to batch variation. Continuous biomanufacturing processes will result in more efficient equipment usage as well as greater flexibility. Development of continuous membrane based bioseparations is essential. The presentation will highlight virus filtration. Virus filtration is routinely used for validation of virus clearance in the manufacture of biopharmaceutical products. Our results indicate that development of membranes that are compatible with constant flux operation as opposed current practice which is based on constant pressure operation will be required.

There is growing interest in complex therapeutics, e.g., live attenuated virus vaccines, viral vectors for delivery of gene therapy, VLPs, plasmid DNA, cell-based therapies. The presentation will highlight some of the challenges e.g. recovery of filled virus capsids from defective capsids involved in the purification of these biological ‘particles’.

Sustainable waste management practices will be essential in order promote a circular economy. The over exploitation of natural resources required to achieve economic growth and development has negatively impacted the environment. Consequently, the idea of a circular economy, which offers new ways to create a more sustainable economic growth model, is very attractive. Membrane based separations are attractive as they are often more environmentally friendly.

Here the use of electrocoagulation as a feed pretreatment operation prior to membrane distillation will be described. Today highly impaired hydraulic fracturing flow back water is typically reinjected into a geologically isolated formation in the Earth's crust. However, treating this highly impaired water for beneficial uses will promote a circular economy. The advantages of an integrated electrocoagulation, microfiltration and membrane distillation process for maximizing water recovery from hydraulic fracturing produced water will further highlight the potential for process intensification through integrated membrane- based separation processes.

Ranil Wickramasinghe is a distinguished professor in the Department of Chemical Engineering at the University of Arkansas. He holds the Ross E Martin Chair in Emerging Technologies and is an Arkansas Research Alliance Scholar. He is director of the Center for Membrane Applications Science and Technology, an Industry-University Cooperative Research Center. He obtained his bachelor's and master's degrees from the University of Melbourne and his PhD from the University of Minnesota. He worked in the biotechnology/biomedical industry in the Boston area before joining the Department of Chemical Engineering at Colorado State University. He joined the University of Arkansas in 2011.

Gäste sind herzlich willkommen!