Membrane processes for a sustainable future: Moving from C_2/C_3 chemistry to biotechnogical processes

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The global society has started a journey from using fossil-based raw material to the utilisation of climate-smart sustainable raw materials. Biorefineries have been identified as one of the backbones of the new bioeconomy using fermentation processes to convert biomass to biofuels and –chemicals and thus replacing the conventional C_2/C_3 chemistry with biotechnological processes. In current petro-chemical refineries distillation is the dominating separation concept as most compounds are volatile. However, in contrast to petro-chemical compounds, most compounds derived from biomass are non-volatile. Molecular weight, charge and solubility are therefore the main separation characteristics of extracted biomass compounds, which makes membrane processes a natural key separation technique in current and future biorefinery concepts either as stand-alone units or as process synergies in combining with other separation technologies such as evaporators or high speed separators.

Since the 1970ies, the conventional membrane processes microfiltration (MF), ultrafiltration (UF), nanofiltration (NF) and reverse osmosis (RO) have established themselves in the production of classic fermentation products such as enzymes, antibiotics and organic acids. While, in current biorefineries membrane processes are used from the feedstock preparation to recovery of the fermentation products. This presentation will not only review some of the established membrane applications in fermentation processes and biorefineries but it will also provide some insight related to the latest applications of membranes in fermentation processes and biorefineries realised on industrial scale using different raw materials. Furthermore, the presentation will final provide an outlook related to membrane applications in lignocellulose-based and agriculture residual based biorefineries.

Overall, this presentation will show that membrane processes as stand-alone units and as process synergies are not only established in classic fermentation processes but they are also core to the development of current and future biorefinery concepts.