

## **Designing membrane processes across length-scales**

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Synthetic membranes enable life support systems such as artificial organs, sanitary water production and energy harvesting. Today's academic research focusses strongly on the development of new materials for such applications. Yet, the road from material discovery to process implementation is long and seldomly granted with success. Little attention in fact is paid to relate process system design to material properties.

In this presentation, an overview is given on how to theoretically describe the details of the different length scales involved in membrane separation processes. Based on examples of energy harvesting systems, a methodology is presented allowing the identification of optimized membrane processes. These examples focus on the membrane processes for (a) methane recovery from nitrogen containing natural gas resources, (b) hydrogen recovery from photocatalytic water splitting processes and (c) recovery of a bio-based chemical produced by fermentation.