How Membrane Technology Contributes to Sustainability and Life Sciences

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With inception of FT30-interfacial polyamide chemistry by the late John Cadotte, there has been continued significant interest in the last few decades to improve both energy and separation efficiency for reverse osmosis operations from a membrane chemistry standpoint. However owing to the complex crosslinked nano scale morphological structure of polyamide, development of structure-property relationships has been a challenge. In the last few years, leveraging Dow's strong analytical capabilities and blending with Dow Water& Process Solution expertise, it has been possible to achieve a true fundamental structure-property relationship of polyamide RO membrane. In depth characterization of polymer composition, morphology, topology and post gel properties coupled with fundamental transport and structural modeling led to a breakthrough in membrane chemistry innovation. The breakthrough membrane chemistry resulted in lowering the energy requirements for brackish water RO operations by 35% and at the same time reduced salt passage by 40 % over industry standard product. The technology was recently named as Dow's second ever breakthrough to a world challenge. It is expected that this breakthrough technology will result in the production of over 15 trillion cubic meters of clean water (the volume of over 6 million Olympic-sized swimming pools), while saving over 2 billion kilowatt-hours of energy and over 1.5 million metric tons of CO2 emissions.

In parallel to addressing sustainability, membranes offer potential economic and technical advantages in addressing the unmet separation needs for several bio based applications. Nano filtration membranes are well known for their unique separation abilities in bio processing, food and diary and pharmaceuticals industries. The presentation will try to address these unique applications and highlight the upcoming technical challenges and opportunities.