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IN-SITU STUDIES OF THIN-FILM COMPOSITE REVERSE OSMOSIS MEMBRANES WITH SMALL-ANGLE NEUTRON SCATTERING DURING THE PROCESS OF DESALINATION

Dietmar Schwahn

Technische Universität München, Germany

Formation of aggregates caused by the interaction of organic and inorganic molecules, in particular those involved in the formation of calcium phosphate minerals, have strong negative influence on membrane permeability in reverse osmosis (RO) wastewater desalination. A better understanding of the origin of these aggregates is needed. Small-angle neutron scattering (SANS) along with the technique of contrast variation is a strong tool in this field as it is a non-destructive technique allowing quantitative analysis on microscopic length scales between 1 nm and μm as well as distinction between organic and inorganic components [1,2]. One of our goals is the realization of in-operando SANS experiments on RO desalination at close to realistic conditions. For this purpose, we developed a cell for real-time SANS experiments simulating the process of RO-wastewater desalination up to 25 bar [3]. It is shown that the scattering from RO membranes is very strong and dominating. Membrane performance was determined in parallel to SANS by measuring water permeability and rejection. In this talk I will give a short description of the in-operando equipment followed by presentation of SANS data on the morphology of TFC RO membranes in particular of the polyamide active layer, as well as recent results from in-situ desalination SANS contrast variation experiments.

Biography

Dr Dietmar Schwahn is a senior scientist at the Forschungs-Neutronenquelle Heinz Maier-Leibnitz of the Technical University of Munich. His research interests are Neutron scattering techniques, phase behaviour of polymer blends and supercritical liquids, biomineralisation, process of wastewater desalination.

d.schwahn@fz-juelich.de