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Effect of organic Matter on RO Membrane Scaling in Wastewater Desalination

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Biofouling and scaling are major limitations of membrane-based desalination techniques. In particular scaling by calcium phosphate on reverse osmosis (RO) membranes limits the desalination efficiency of secondary wastewater effluents. The exploration of biofilm formation and of scaling is the topic of our research. Our particular interest is the effect of components representing the biofilm on calcium mineralization at a molecular level using the experimental technique of small-angle neutron scattering (SANS). To this end we are studying the formation of calcium minerals in a model solution simulating a secondary waste water effluent (SSE) [1] after adding biopolymers as single molecules or as grafted at gold nanoparticles. The latter experiment should simulate mineralization at surfaces such as membranes. SANS is a promising tool in this field as was demonstrated on similar studies in the related field of biomineralization [2]. We will present data showing the process of mineralization in SSE solutions stimulated by some relevant proteins (BSA, lysozyme) and polysaccharides (alginic acid, chitosan) using stopped-flow technique in combination with classical as well as with focusing ultra-small SANS techniques [3]. This work was funded by the Ministry of Science, Culture and Sport (MOST) and the Bundesministerium für Bildung und Forschung (BMBF).

[1] Z. Steiner, H. Rapaport, Y. Oren, R. Kasher, *Environmental Science & Technology*, 2010, 44, 7937-7943., [2] A. Heiss, V. Pipich, W. Jahnen-Dechent, D. Schwahn, *Biophysical Journal*, 2010, 99, 3986-3995., [3] V. Pipich, Y. Dahdal, H. Rapaport, R. Kasher, Y. Oren, D. Schwahn, *Langmuir*, 2013, 29, 7607-7617.

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