



Contribution ID: 14

Type: **Talk (20 min + 5 min discussion)**

## **Scaling and Fouling in Reverse Osmosis Wastewater Desalination –Operando Studies with Small-Angle Neutron Scattering**

*Thursday, 8 December 2022 15:50 (25 minutes)*

We present operando small-angle neutron scattering (SANS) experiments on silica and protein (BSA) fouling as well as scaling from a simulated secondary effluent (SSE) at the surface of a polyamide RO membrane at close to realistic conditions. In the first part we present a study of aqueous silica dispersions combining the parameters of colloidal radius, volume fraction, and ionic strength. The observation of Bragg diffraction representing a crystalline cake layer of simple cubic lattice structure is observed. Cake layer formation proved to be a reversible process, which could be removed again at larger cross-flow. Only in one case we observed an irreversible cake layer formation showing the characteristics of an unstable phase transition of otherwise liquid-solid phase transitions of first order. The second part deals with organic fouling of BSA dissolved in the SSE solution. Mixing 1 g/L BSA to SSE leads to an instantaneous formation of stable organic-mineral colloids, i.e. composite particles of about 1 size only increasing in number density. Their composition was about 50% protein and 50% mineral, mainly calcium phosphate and carbonate as analysed from former contrast variation SANS measurements. After about 17 h the particle size increases to about 3 without any external influence and showing no effect on permeate flux and electric conductivity. Similar behavior was already observed in former in vitro experiments.

**Primary author:** Dr SCHWAHN, Dietmar (JCNS)

**Presenter:** Dr SCHWAHN, Dietmar (JCNS)

**Session Classification:** Soft Matter

**Track Classification:** Soft Matter