Membrane-Particle Interactions using Asymmetric Flow Field Flow Fractionation (A4F) as a Technique for Nanoparticle Separation – The Influence of the $\zeta$-Potential

Losert S.1,2, Dübendorf/CH, Bendixen N.1,3, Dübendorf/CH, Hungerbühler K.2, Zurich/CH

1EMPA Swiss Federal Laboratories for Materials Testing and Research, Überlandstrasse 129, CH-8600 Dübendorf, Switzerland
2ETHZ Swiss Federal Institute of Technology Zurich, Wolfgang-Pauli-Str. 10, CH-8093 Zürich, Switzerland
3ZHAW Zurich University for Applied Science, Grüntal, P.O. Box, CH-8820 Wädenswil, Switzerland

Asymmetric flow field flow fractionation (A4F) is a powerful and promising technique for the separation of nanoparticles. Operated in a multi-detector approach it can become a fast and quantitative analytical method providing information on particle size, size-distribution and elemental composition at the same time. Even some information on coating or shape of nanoparticles are accessible. A main advantage is also the brought measurable size range reaching from 1 nm to 1 $\mu$m with a size resolution of about 10 nm. Nevertheless there are also some limitations of the technique. Not understood but often observed are e.g. unpredictable particle losses in the A4F channel attributed to occurring particle-membrane-interaction. [1] Visible deposition of particles on the membrane occurs especially in the focus area. Thus, poor recovery rates are observed especially during the first 5 to 10 injections after a membrane or sample type change. Moreover, membrane particle interactions might lead to certain shifts in retention time, which influences size calibration by standard particles like polystyrene. Thus, this study focuses on a detailed investigation of such particle-membrane-interactions and discusses possible influence factors like material type, cut-off, surface morphology as well as $\zeta$-potential of the particles and the membrane material itself. First results have been already published treating investigations considering the charge of the membrane surface dependent on the type and cut-off. [2, 3] Moreover, influence factors like possible surfactants or pH are studied. Besides, surface morphology was studied.