

Optimization of the *in-line* SEC-MALS-RI at the Small-Angle Neutron Diffractometer KWS-2

J. Kang^{a,*}, H. Iwase^b, G. Brandl^a, C. Lang^a, R. Biehl^c and A. Radulescu^a

^aJülich Centre for Neutron Science at Heinz Maier-Leibnitz Zentrum (JCNS-4), Forschungszentrum Jülich, Garching 85748, Germany

^bNeutron Science and Technology Center, Comprehensive Research Organization for Science and Society (CROSS), Tokai, Ibaraki, 319-1106, Japan

^cJülich Centre for Neutron Science (JCNS-1) & Institute of Biological Information Processing (IBI-8), Forschungszentrum Jülich, Jülich 52425, Germany

An *in-line* size exclusion chromatography (SEC) setup is established at the small-angle neutron scattering (SANS) diffractometer KWS-2 as a new sample environment serving to deliver freshly eluted sample for SANS data collection. The present work describes the establishment and the performance of the *in-line* SEC option.

Given the spatial restriction around the KWS-2 hutch, the development of the *in-line* SEC instrument is challenging in the sense that SEC is located 2.5 meters away from the SANS sample stage. In order to test on such arrangement and to quantify the possible sample dilution effect of the additional dead volume by the long capillary, an additional UV detector is installed on the SANS sample stage to provide information on the chromatography performance and the protein concentration at the neutron exposure position. Based on the experimental result, a small dilution was found after the eluted sample from SEC instrument flows through the capillary and reaches the SANS stage, and, judging by the similar FWHM of the main elution peak, the chromatography resolution stays almost unchanged. Using 10 mg/ml of bovine serum albumin solution (injection volume 200 μ l) for performance examination, a dilution factor for its monomer was found to be 3.4, which is comparable to other SEC-SAXS and SEC-SANS instruments worldwide.

The setup can be further combined with the multi-angle light scattering (MALS) machine followed with a refractive index (RI) detector, which enables the determination of molar mass of the eluted sample.

The presented examination measurements all together show that the described *in-line* SEC-MALS-RI at KWS-2 is ready for a testing with neutron in the near future, and it will be open to the user community soon after the testing.