Development of a fully automated online mixing system for SAXS protein structure analysis

This thesis presents the development of an automated high-throughput mixing and exposure system for Small-Angle Scattering analysis on a synchrotron using polymer microfluidics. Software and hardware for both automated mixing, exposure control on a beamline and automated data reduction and preliminary analysis is presented. Three mixing systems that have been the corner stones of the development process are presented including a fully functioning high-throughput microfluidic system that is able to produce and expose 36 mixed samples per hour using 30 μL of sample volume. The system is tested both using an integrated UV cell and by Small Angle X-ray scattering experiments performed at a synchrotron. A short overview of the underlying theory and considerations both regarding Small-angle scattering data reduction, analysis techniques and microfluidic mixing using continous laminar flow is also given.

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