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Microfluidic-SANS: insitu molecular insight into complex fluid processing and high throughput characterisation CARLOS LOPEZ, Imperial College London, TAKAICHI WATANABE, Okayama University, JOAO CABRAL, Imperial College London, PETER GRAHAM, Unilever, LIONEL PORCAR, ANNE MARTEL, Institut Laue-Langevin — The coupling of microfluidics and small angle neutron scattering (SANS) is successfully demonstrated for the first time. We have developed novel microdevices with suitably low SANS background and high pressure compatibility for the investigation of flow-induced phenomena and high throughput phase mapping of complex fluids. We successfully obtained scattering profiles from 50 micron channels, in 10s – 100s second acquisition times. The microfluidic geometry enables the variation of both flow type and magnitude, beyond traditional rheo-SANS setups, and is exceptionally well-suited for complex fluids due to the commensurability of relevant time and lengthscales. We demonstrate our approach by studying model flow responsive systems, including surfactant/co-surfactant/water mixtures, with well-known equilibrium phase behaviour,: sodium dodecyl sulfate (SDS)/octanol/brine, cetyltrimethyl ammonium chloride (C16TAC)/pentanol/water and a model microemulsion system (C10E4 /decane/ D20), as well as polyelectrolyte solutions. Finally, using an online micromixer we are able to implement a high throughput approach, scanning in excess of 10 scattering profiles/min for a continuous aqueous surfactant dilution over two decades in concentration.

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