The elucidation of microemulsion properties – my scientific journey with Isabelle

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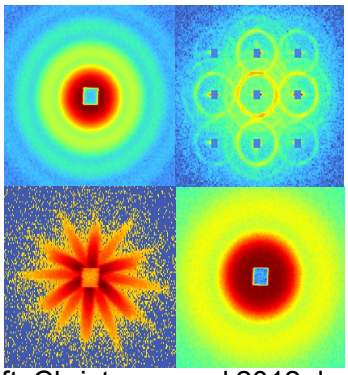
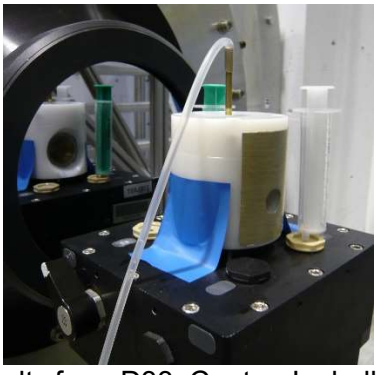
The journey together with Isabelle started 20 years ago in February 2000 at D22. The goal of these studies was to find the mechanism behind the dramatic enhancement of the solubilisation efficiency of ordinary surfactants obtained by adding only traces of amphiphilic diblock copolymers. Performing high-precision two-dimensional contrast variation SANS measurements [1] we could demonstrate that the polymer is distributed uniformly in the surfactant membrane where it influences its bending rigidity, saddle-splay modulus and curvature. Although being highly relevant for washing, tertiary oil recovery, etc. the efficiency boosting effect is so far only rarely used in technical application. One drawback is the difficult large-scale synthesis of the originally applied polyethyleneoxide–polyethylpropylene polymers. To circumvent this drawback we very recently applied a new class of poly(ethylene oxide)-*b*-poly(alkyl glycidyl ether) block copolymers [2], which excel by an easy scalable synthesis, to microemulsions containing long chain *n*-alkanes and technical relevant waxes [3]. Interestingly, only by the use of this new class of polymers an efficient solubilization of these large oil molecules is obtained [4]. As friendly users, Isabelle in 2012 gave us the chance to study the formation of kinetics of polymer-free microemulsion shortly after the commissioning of D33, which turned out to be of the order of a few milliseconds [5]. In future we plan to study the influence of these polymers on the formations kinetics of microemulsions using Isabelle's favored spectrometer.





Left: Christmas card 2012 designed by Isabelle showing first results from D33. Center: Isabelle Right: Stopped-flow with temperature controlled cell holder designed and donated from the University of Cologne at D33.

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[2] P. Verkoyen, T. Johann, J. Blankenburg, C. Czyscha, H. Frey, *Polym. Chem.* 9, 5327 (2018).
[3] K. Schneider, T.M. Ott, R. Schweins, H. Frielinghaus, O. Lade, T. Sottmann, *Ind. Eng. Chem. Res. 58*, 2583 (2019).
[4] K. Schneider, P. Verkoyen, M. Krappel, C. Gardiner, R. Schweins, H. Frey, T. Sottmann *Langmuir*, to be submitted.
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