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Comparison of the size shape and interactions of sodium perfluorooctanoate and ammonium perfluorooctanoate micelles using small-angle x-ray scattering

The study of the fluorocarbon amphiphiles in aqueous media and their association with counterions is crucial for understanding their interactions under different conditions. This knowledge gained will be valuable in characterising these surfactants and finding ways to remove them from the environment. The micellar size and shape of fluorocarbon surfactants sodium perfluorooctanoate (NaPFO) and ammonium perfluorooctanoate (APFO) in aqueous media were compared using small angle X-ray scattering (SAXS). Both surfactants formed micelles in water above their critical micellar concentration, with the critical micellar concentration of APFO being lower than the NaPFO. The CMCs of APFO and NaPFO are approximately 23 mmol dm⁻³ and 22 mmol dm⁻³ respectively, determined by measurement of conductivity. Both NaPFO and APFO micelles are elongated in shape. The difference in the size of the micelles is due to the different counterions (sodium and ammonium) that also leads to different electrostatic interactions with the surfactant head groups. To gain further insight into the hydration of these micelles, we plan to use small angle neutron scattering (SANS). Previous studies on these two surfactants have been done by Berr et al¹ (NaPFO) who interpreted data as spheres with a radius that is unusually large and Burkitt et al² (APFO) found the shape of the micelles to be best modelled as cylinders.

Primary authors: RENNIE, Adrian R. (Uppsala University); Dr AHRENS, Lutz (Swedish University of Agricultural Sciences); SANGA, Njelama (Uppsala University)

Presenter: SANGA, Njelama (Uppsala University)

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