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## Using Neutron Reflectometry to study atmospheric ageing of organic surfactant aerosol proxies

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Atmospheric aerosol particles can be coated with organic materials, impacting aerosol atmospheric lifetime and urban air quality. Coatings of organic materials are also found on indoor surfaces such as window glass. Oleic acid is a fatty acid surfactant that is abundant in cooking and marine aerosol emissions. Under ambient conditions it can self-assemble into lamellar bilayers (stacks) with its sodium salt. We have used neutron reflectometry (NR) to characterise the morphology of oleic acid–sodium oleate mixed films spin-coated onto solid silicon substrates and found these to form a mixed-phase film containing lamellar stacks and amorphous parts. When subjected to simulated atmospheric ageing (ozonolysis and humidity changes), we observed significant changes in structure and properties of these films (orientation of lamellar stacks, increase in film hygroscopicity after oxidation etc). Lamellar stacks, consisting only of starting materials, persisted at the end of simulated atmospheric ageing. These findings for atmospherically relevant nano-scale films corroborate previous work on micrometre-scale layers, thus demonstrating that fatty acid self-assembly could significantly increase the atmospheric lifetime of these molecules. The persistence of such semi-solid surfactant arrangements in the atmosphere has implications for the climate as well as urban and indoor air pollution.

[1] Milsom et al., Environ. Sci.: Atmos., 2022, 2, 964.

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