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Food protein superstructures on interfaces as seen by X-rays

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Pulses and beans are important protein sources in the current protein transition, but much of the behavior of pulse proteins in food systems is still unknown. In particular in interface-dominated materials (emulsions, foams, etc), the nanoscopic behaviour of a protein –how they fold, stretch, and lock into place –governs whether a protein assembly ends up as a gel, a glass, or something in between.

In our lab we have used high resolution AFM to reveal the superstructures of pulse proteins on the air-water interface. While this is very insightful, such films are lifted from the interface and are dry. Scattering techniques are ideal for an in-situ analysis of pulse protein interfacial superstructures. In our recent work, we have performed different scattering experiments to glean in situ information on several hierarchical levels of protein assembly. Transmission SAXS shows how the individual protein shape is affected by adsorption to the interface, whereas in situ grazing incidence (GI)SAXS gives us a unique insight in how protein superstructures are formed during the adsorption and aging process.

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