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Breaking boundaries, or is it? Physical disruption at the nano- and micro scales for an in situ flow setup

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For various soft and hard matter systems, reduction in sample particle size could be an effective method for producing homogeneous samples, eliminating trapped air bubbles, facilitating sample preparation (e.g., gel loading), or meeting the requirements of a specific sample environment. Due to the experimental constraints of small-angle scattering, such as the limited width (1 or 2 mm) of the sample cell, time-dependent characterisation of larger samples in real time is often not possible. Physical disruption of samples into smaller sized particles at a macro scale would allow simultaneous characterisation of a variety of systems, such as facilitating the flow of polymers, gels, aggregates, and minerals. While physical crushing or blending may appear to be a straightforward solution to the problem, a lack of knowledge about the effect on the nano- and microstructure precludes its widespread adoption.

In this study, a yoghurt-like transglutaminase-induced acid gel (TG), was blended as a method of disruption, allowing the gel particles to flow freely in the newly developed recirculated flow set-up designed for the in situ analysis of gel devolution over time. The study has demonstrated that mechanical disruption to form TG particle distributions within the 5-6 μm to ~ 3.5 mm size range had no effect on the micro- and nanostructure of the gel. This work could benefit several studies, including dynamics of hydrogel swelling, characterisation of particles in motion, digestion or changes in structure when exposed to different environmental conditions, as well as the implementation of newly developed setups in several neutron scattering studies.

Presenter Gender

Woman

Do you wish to take part in the Student Poster Slam

Yes

Condition of submission

Yes

Students Only - Are you interested in AINSE student funding

Yes

Level of Expertise

Student

Pronouns

She/Her

Which facility did you use for your research

Australian Centre for Neutron Scattering

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