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Fractal scaling of Dairy gels: A rheology and neutron scattering study

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Milk and dairy products are common food systems. One of their important constituents is casein micelles (CM) (~10-100 nm) that form extended aggregates, and further develop into a network by the process of gelation. A key structural parameter is the fractal dimension (D_f) of this network[1-3]. Scattering and rheology have been explored in the past to access the relevant length scales and D_f of such systems[1-6]. In the present work, dairy gels are formed using two different mechanisms: acidification, and enzymic (rennet)-induction [3,6]. The effect of mineral equilibria on enzymatic coagulation of skim milk is also explored[7]. Both the gels are investigated using oscillatory rheology, and ultra-small-angle neutron scattering (USANS) at different concentrations. Contrast variation, through the variation of H_2O/D_2O ratios, facilitates selective visualization of fat and protein components, and importantly the CM network during network formation. The perspectives on D_f from both the techniques are compared to understand the inherent structural hierarchy.

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Primary author: Dr KODUVAYUR ANANTHANARAYANAN, Ramya (Post doctoral fellow, TUM Garching)

Co-authors: GARVEY, Christopher (MLZ); Dr BOUÉ, François (Professor); Dr BAULAND, Julien (Postdoc); DE CAMPO, Liliana (Australian Nuclear Science and Technology Organisation, Locked Bag 2001, Kirrawee DC, NSW 2232, Australia); STROBL, Markus (PSI); Dr GIBAUD, Thomas (Professor)

Presenter: Dr KODUVAYUR ANANTHANARAYANAN, Ramya (Post doctoral fellow, TUM Garching)

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