Beitrag ID: **93** Typ: **Contributed Talk**

In-situ microbiological dairy gel formation probed by Bonse-Hart ultra small angle neutron scattering

Dienstag, 17. September 2024 15:20 (20 Minuten)

Neutrons, by virtue of their non-destructive non-ionising nature, can provide a statistical and 3-dimensional perspective on structure in a range of model and industrial systems. Dairy gels, where the formation of a network of casein micelles from milk forms a barrier to mass transport, are the basis of major class food products manufactured from. Herein we follow on from our previous work examining the link between the mechanical properties of these gels and structure of the underlying fractal network [1]. The Bonse-Hart ultra-small angle neutron scattering (USANS) technique at the instrument KOOKABURRA (ANSTO, Australia) [2] utilizes two-channel cut (111) Si crystals to provide extremely good angular resolution of scattered neutrons in the horizontal direction but poor resolution in the vertical direction. KOOKABURRA provides well normalized slit smeared scattered intensity over a range of scattering vectors, 3 x 10^{-5} $Å^{-1}$ < q < 0.01 $Å^{-1}$. In the present work, we exploit the non-ionizing technique to probe the formation of milk gels in-situ by actively metabolizing microbial systems, and modelling the slit-smeared scattered intensity with the network model of fractal aggregation by Teixeira [3]. We discuss the formation of a gel network and the broader application of this approach to food gels.

References:
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[3] Teixeira, J., Journal of applied crystallography 21 (6), 781-785, 1988.

Hauptautoren: GARVEY, Christopher (Forschungs- Neutronenquelle Heinz Maier-Leibnitz (FRM II)); KODUVAYUR ANANTHANARAYANAN, Ramya (GNeuS Postdoc Fellow, Forschungs-Neutronenquelle Heinz-Maier-Leibnitz (FRM II), Technische Universität München, Garching, Deutschland)

Co-Autoren: Dr. BOUÉ, François (Laboratoire Léon Brillouin, CNRS-UMR12-CEA-Université Paris-Saclay, 91190 Gif-sur-Yvette, France); Dr. DE CAMPO, Liliana (Australian Nuclear Science and Technology Organisation, Lucas Heights 2234 NSW, Australia); Dr. STROBL, Markus (Laboratory for Neutron Scattering and Imaging, Paul Scherrer Institut, 5232 Villigen, Switzerland)

Vortragende(r): KODUVAYUR ANANTHANARAYANAN, Ramya (GNeuS Postdoc Fellow, Forschungs-Neutronenquelle Heinz-Maier-Leibnitz (FRM II), Technische Universität München, Garching, Deutschland)

Sitzung Einordnung: Session 6: Health and Life (Chairs: Tobias Schrader & Emanuel Schneck)

Track Klassifizierung: Health & Life