Beitrag ID: **106** Typ: **Poster**

Structural evolution of a model colloidal gel in a simple shear field

Dienstag, 17. September 2024 22:40 (20 Minuten)

Colloidal gelation, where colloidal scale particles aggregate and form a network, is a fundamental process with industrial relevance.(Jadrich et al., 2023) Following from our previous work on the structure formed by a simple system of gelling colloidal particles in a Couette shear field(de Campo et al., 2019, Muzny et al., 2023) we study the time evolution of the structure over an extended range of scattering vectors, 3x10-4 nm-1 < q < 3.1x10-1 nm-1. This range of scattering vectors contains information about the individual nano-scale sol particles and the network formed by the gelling particles. Two instruments at the Australian Centre for Neutron Scattering (Lucas Heights, Australia) were utilized: conventional pinhole SANS (BILBY(Sokolova et al., 2016)); and slit smeared intensity from a Bonse-Hart USANS (KOOKABURRA)(Rehm et al., 2018). Gelation was initiated from a model system of silica nanoparticles where a slight adjustment of the pH modulated interparticle interactions. In the absence of shear we observe that the sol rapidly increases in viscosity until flow is arrested, in the case of an applied shear we observe that viscosity rapidly increases until it reaches a maximum, and then viscosity decreases. Scattering curves at constant shear rate were modelled to yield the growth and volume fraction of clusters. Derived structural parameters were used to calculate viscosities from a simple theoretical model(Gillespie, 1983) which gives excellent agreement with measured viscosities.

de Campo, L., C. J. Garvey, C. D. Muzny, C. Rehm, and H. J. M. Hanley. 2019. Micron-scale restructuring of gelling silica subjected to shear. Journal of Colloid and Interface Science 533:136-143.
Gillespie, T. 1983. The effect of aggregation and particle size distribution on the viscosity of newtonian suspensions. Journal of Colloid and Interface Science 94(1):166-173.
Jadrich, R. B., D. J. Milliron, and T. M. Truskett. 2023. Colloidal gels. The Journal of Chemical Physics 159(9):090401.
Muzny, C., L. de Campo, A. Sokolova, C. J. Garvey, C. Rehm, and H. Hanley. 2023. Shear influence on colloidal cluster growth: a SANS and USANS study. Journal of Applied Crystallography 56(5).
Rehm, C., L. de Campo, A. Brule, F. Darmann, F. Bartsch, and A. Berry. 2018. Design and performance of the variable-wavelength Bonse-Hart ultra-small-angle neutron scattering diffractometer KOOKABURRA at ANSTO. Journal of Applied Crystallography 51(1).
Sokolova, A., J. Christoforidis, A. Eltobaji, J. Barnes, F. Darmann, A. E. Whitten, and L. de Campo. 2016. BILBY: Time-of-Flight Small Angle Scattering Instrument. Neutron News 27(2):9-13.

Hauptautoren: Dr. SOKOLOVA, Anna (Australian Nuclear Science and Technology Organisation,); GARVEY, Christopher (Forschungs- Neutronenquelle Heinz Maier-Leibnitz (FRM II)); Prof. HANLEY, Howard (Applied Mathematics, Research School of Physics, Australian National University); DE CAMPO, Liliana (Australian Nuclear Science and Technology Organisation)

Vortragende(r): GARVEY, Christopher (Forschungs- Neutronenquelle Heinz Maier-Leibnitz (FRM II))

Sitzung Einordnung: Mounting Posters, Beer and light Dinner

Track Klassifizierung: Soft Matter