Materials
chaired by Alexander Brinkman/Sissi de Beer – room 7

11.45-12.00	*Rotational Diffusion of Rough Colloids* Beybin Ilhan (PCF)
12.05-12.20	*Supramolecular networks: a tensegrity based approach for active tissue-like mechanics* Federico Lancia (BNT)
12.25-12.40	*Exploit thermal strain to engineer oxide functionalities on silicon* Binbin Chen (IMS)
12.45-13.00	*In-situ probing of a possible oxide topological insulator* Rosa Luca Bouwmeester (ICE/QTM)

Rotational Diffusion of Rough Colloids, Beybin Ilhan (PCF)
Colloidal particles with surface roughness are expected to exhibit different rotational dynamics in dense suspensions compared to their smooth counterparts due to enhanced friction. Measuring the diffusion of colloidal particles is essential for understanding the dynamic behavior of such colloids. Even though translational diffusion of spherical particles is relatively accessible and has been extensively investigated, rotational diffusion is more challenging to capture, due to the symmetry of the particles. Here we demonstrate a novel experimental technique to measure the rotational dynamics of surface rough spherical particles in three dimensions with confocal scanning laser microscopy (**CSLM**). The method is based on introducing an optical anisotropy to the raspberry alike particles while preserving the shape isotropy. We use particle tracking algorithms to follow the rotational dynamics of rough colloids suspended in different refractive index matched solvents over a range of volume concentrations (). In the dilute regime results already show that the experimental values reasonably agree with the theoretical values.

Supramolecular networks: a tensegrity based approach for active tissue-like mechanics, Federico Lancia (BNT)
Some features of cellular mechanics, such as prestress-induced stiffening, can be explained and modelled by considering the cell`s cytoskeleton as a tensegrity network hold together by a balance of tensile stress, generated by molecular machines, and compression, carried by microtubules. These mechanical features of the cell, coupled to the mechanical response of the extracellular matrix are key to overall tissue mechanics. In this presentation I will propose a supramolecular based approach to design fully artificial tensegrity networks to bring man-made soft materials closer to the dynamic properties of tissues. Our approach involves the formation of hydrogel networks by cross-linking flexible polymer chains with light responsive artificial microtubules with high persistent length capable of assembly and disassembly depending on irradiation conditions.

Exploit thermal strain to engineer oxide functionalities on silicon, Binbin Chen (IMS)

The integration of multifunctional oxides on Si remains challenging which largely hampers the practical applications of oxide-based electronic devices with superior performance. In this talk, we show that, by using a $SrTiO_3$ buffer layer, it is possible to grow high-quality oxide heterostructures and superlattices on Si in a well-controlled manner by pulsed laser deposition. The structural characterizations reveal a significantly larger in-plane lattice constant for the films grown on Si, as compared to those grown on $SrTiO_3$ single-crystal substrates. Such tensile strain originates from the difference in thermal expansion coefficients between oxides and Si. The thermal strain can be exploited to tune oxide functionalities since both the magnetic interactions and bandwidths are susceptible to structural deformations. Here, we take the $LaMnO_3/SrTiO_3$ heterostructures and $LaNiO_3/LaFeO_3$ superlattices as examples to illustrate the thermal-strain effects in correlated oxides integrated on Si.

In-situ probing of a possible oxide topological insulator, Rosa Luca Bouwmeester (ICE/QTM)

Topological insulators form a promising class of materials for applications in the field of spintronics and quantum computing. However, to be applicable at room temperature, large bulk band gaps are required. $YBiO_3$ in the perovskite crystal phase has been predicted to be a large-band-gap topological insulator. However, the thermodynamically stable phase is the fluorite phase. We have used a $BaBiO_3$ buffer layer to stabilize the required perovskite phase in the Y-Bi-O system, fabricated as a thin film by pulsed laser deposition. With *in-situ* scanning tunneling spectroscopy and *in-situ* four-probe transport measurements, we investigate the possible topological nature of the electronic structure and electronic transport properties.