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Near surface dynamics in thin adsorbed layers of ethylene glycol (EG) based thermoresponsive microgel particles

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Scanning the dynamic profile across thin polymer coatings opens a new field for a better understanding and the design of novel surface functionalisation. Surface functionalisation via formation of stimuli-responsive surface structures using colloidal structures is an active field of research.
Here, we used ethylene glycol (EG) based thermoresponsive microgel particles as building blocks and studied their adsorption at silicon surfaces.1) They are investigated with respect to potential biomedical applications aiming on a systematic combination of the intrinsic biocompatibility of PEG with the physico-chemical properties of microgels to overcome the biomedical drawbacks of other systems. Scattering techniques (DLS, SANS) were used to systematically characterize particle size and inner structure depending on the comonomer content2) and the reaction time of the precipitation polymerization3). The cooperative and inner dynamics of the dispersed microgel particles was characterized by neutron spin echo spectroscopy in transmission geometry (NSE).
To access the inner properties oft he adsorbed microgel particles we used the newly established method of neutron spin echo spectroscopy under grazing incidence (GINSES)4). The reported GINSES experiment shows technically, that the dynamic profile within layers of colloidal objects of less than 200 nm height can be scanned perpendicular to the substrate surface.
The scientific impact is that the slowing down of the dynamics towards the substrate might have a strong effect on the swelling/deswelling ratio, the swelling kinetics and eventually even on the VPTT.
This is of fundamental interest with respect to application of adsorbed gels e.g. in catalysis, for sensors or for implants.

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