Some strategies to keep under control radiation damage in Soft Matter

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I will discuss results obtained, but also problems encountered while trying to characterize dynamics of different soft matter systems.
I will start from a photosensitive polymer, a polymethyl-azoacrylate, known to fluidify under UV illumination, due to photoinduced isomerization of the azobenzene moiety attached as a side chain. Its slow dynamics was investigated by XPCS, first in the bulk, as a function of illumination and then, more fruitfully, with the same polymer spread in the form of a Langmuir-Schaeffer multilayer molecular film [1]. In this second geometry, radiation induced effects could be better kept under control also thanks to geometrical spreading of the dose on a large footprint.
I will also discuss the effect of gold nanoparticles added to better trace dynamics, aiming at reaching a higher signal-to-noise ratio with lower incident radiation intensity [2].
I will then report on a series of XPCS experiments on Langmuir monolayers formed by gold nanoparticles at the air-water interface [3,4], and on monolayers formed by the phospholipid DPPC in the presence of silica nanoparticles of either hydrophilic [5] or hydrophobic nature [6]. In all these cases, the grazing incidence geometry of the X-ray experiment helped us to keep under control radiation induced effects, while a combination of different experimental techniques, including advanced image analysis, was used to validate the interpretation also by extending the Q-range accessible.

References

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