INTERACTION OF SURFACE-MODIFIED SILICA NANOPARTICLES AND BIOLOGICAL COMPONENTS: A SYNCHROTRON APPROACH

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ABSTRACT:

Once in contact with complex biological fluids, nanoparticles (NPs) interact with many physiological components (e.g., amino acids, salts, proteins) that may induce colloidal destabilization or changes in their original identity. Consequently, proteins and other biomolecules can adsorb on the NPs' surface and give them a new biological identity that masks their original functionality and hampers their ability to reach the intended target site. This phenomenon also decreases NPs colloidal stability or leads to the activation of an unplanned biological pathway, which contributes to low treatment efficiency rates as well as the appearance of undesirable secondary effects. These NPs-biological components interactions are considerably complex, and state-of-the-art strategies must be employed to probe them properly. Consequently, over the years, we have been tailoring silica nanoparticles (SNPs) surface to tune these nano-bio interactions finely and thus enhance particular phenomena never seen before. In parallel, synchrotron techniques appear as a promising alternative since they open new possibilities to explore statistically and locally these complex interactions. During this talk, we will explore how synchrotron-based techniques can be employed to investigate these nano-bio interactions and small-angle X-ray scattering (SAXS), nano-infrared spectroscopy (nano-IR), and circular dichroism (SR-CD) will be in-depth discussed. We will demonstrate the relevance of these techniques in probing SNPs-albumin interaction as well as how they have brought shreds of evidence about the intimate contact between carbohydrate-functionalized SNPs and *E.coli* bacteria.

References

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