Colloidal nanomaterials for life science: tailoring surface chemistry for old, new and emerging functions

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In the last years, the extraordinary advances in the field of nanomaterial science have resulted in a great potential for applications in life science.
A variety of preparative and post-preparative colloidal routes have demonstrated able to obtain a wide choice of inorganic nanoparticles (NPs) and nanocrystals (NCs), with different compositions, that can be achieved with a high control on size, shape and surface chemistry, ultimately tailoring their electronic, optical, magnetic, thermal and chemical size dependent properties. A range of functionalization strategies have been developed to suitably engineer the surface of NPs and NCs and tune their specific chemical reactivity towards the surrounding environment. The control of nano-bio interfaces has demonstrate essential to enable nanomaterials conjugation and combination with biologically relevant entities, thus producing advanced materials for diagnostics and therapy. The ability of engineering the surface of specialized nanomaterials, such as semiconductors, plasmonic and magnetic nanostructures, with tailored procedures, allowing to ingeniously combine NPs and NCs with peptides, drugs and other significant biological systems, is decisive for their application in diagnosis and treatment of different diseases, including cancer and neurodegenerative disorders. In particular, examples of drug delivery, labelling, diagnostic and theranostics systems, based on NIR photoactive nanomaterials, plasmonic nanostructures and magnetic NPs will be reported.

References

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[3] G. Valente, N. Depalo et al Nano Research, 9 (2016) 644.
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Figures

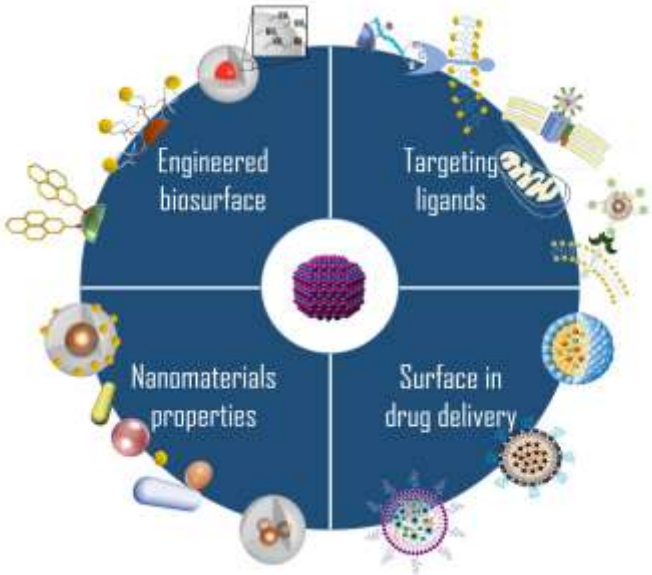

Figure 1: Engineering bio-interface in colloidal nanomaterials for diagnosis and therapy

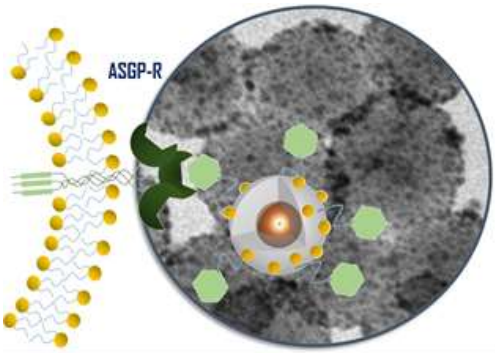

Figure 2: Carbohydrate bioconjugated magnetic/plasmonic Au NPs decorated $Fe_2O_3@SiO_2$ nanostructures for targeting