Responsive Organosilica Nanoparticles

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The development of smart nanoparticles (NPs) that encode responsive features in the structural framework promises to extend the applications of NP-based drugs, vaccines, and diagnostic tools. We have developed nanoparticles able to break on demand and proven their use as drug delivery systems for aggressive tumors.[1] In particular we have used a special morphology, a nanocage structure of only 20 nm that is able to escape macrophage uptake [2] and to stabilize species out of equilibrium for days[3]
More recently, through a nature-inspired approach that combines the programmability of nucleic acid interactions and sol-gel chemistry. In the contribution the incorporation of synthetic nucleic acids and analogs as constitutive components of the organosilica NP structures will be discussed. In particular are illustrated nanomaterials containing single-stranded nucleic acids that are covalently embedded in the silica networks as well as combining the supramolecular programmability of nucleic acid (NA) interactions with sol-gel chemistry the first example of supramolecular silica. This approach allows us to create dynamic bridging units of nucleic acids implemented in a silica-based scaffold. In addition the implementation of a functional NA such as an aptamer, as silica connection, can lead to a specific recognition of ATP molecules.

References

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