

# Hybrid materials: from fundamentals to applications

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Hybrid materials are a class of systems where different components are integrated in order to convey new properties to the single system. In particular in my group we devoted much effort in the design and realization of silica structures containing organic moieties that can be responsive to a stimulus. We realized “containers” able to break in small fragments (<5 nm) by a redox reactions,[1] enzymatic degradation,[2] and pH. They can also be capsules in which large biomolecules such as enzymes and proteins can be entrapped and release on demand[3]. The encapsulation of different drugs and biomolecules will be shortly described with particular emphasis to the release of siRNA for the inhibition of tumor growth.

Using a totally different approach we have realized virus-like particles, utilizing as a template an inorganic core and the natural proteins of a plant virus[4]. We used luminescent Pt(II)-complex amphiphiles, able to form supramolecular structures in water solutions, that can act as templates of viruses capsid proteins. The platinum assemblies can have different morphologies and extremely high emission of which the color depends on the assembly[5]. Interestingly we are able to change the size and shape of the particles even though we use the same natural proteins. The obtained virus-like particles can be visualized by their intense emission at room temperature, generated by the self-assembly of the Pt(II)-complexes inside the capsid.

## References

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