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"Self-assembled and breakable materials for medical applications"

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Self-assembled and breakable materials for medical applications

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In this talk I will discuss just some recent results on biocompatible hydrogel which can release a migration-inducing factor, for the recruitment of stem cells [1], and most interestingly, can be formed in vivo in few seconds [2]. The hydrogel is a composite made of breakable container –type materials able to respond to an external stimulus. In particular in the last 5 years we devoted much effort in the creation of "containers' able to break in small fragments (<5 nm) by a redox reactions [3a], enzymatic degradation, [3b] and pH. They can also be capsules in which large biomolecules such as enzymes and proteins can be entrapped and release on demand [4]. The hydrogels that contain such containers are formed in physiological conditions, without any catalyst and at room or at body temperature. They are perfectly biocompatible and can be made degradable. Applications *in vivo* will be illustrated to validate their potential use and lack of long term toxicity.

Finally I wish to close my talk showing novel capsules that can be realized using a unique approach to template virus proteins to reconstruct virus-like particles. We use luminescent Pt(II)-complex amphiphiles, able to form supramolecular structures in water solutions, [5] 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. 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 capside [6].

[1] F. Fiorini, L. De Cola et al. *Small*, **2016**, 12, 4881
[2] G. Alonci, L. De Cola et al. *ACS Appl. Bio Mater.*, **2018**, DOI**:** 10.1021/acsabm.8b00189
[3] a) L. Maggini, L. De Cola et al. *Nanoscale*, **2016**, 8, 7240 ; b) L. Maggini, L. De Cola et al. *Chem. Eu. J.*, **2016**, 22, 3697
[4] E.A. Prasetyanto, L. De Cola et al. *Angew. Chem. Int. Ed*. **2016**, 55, 3323.
[5] A. Aliprandi, M. Mauro, L. De Cola *Nature Chemistry , **2016**, 8, 10-15*
[6] S. Sinn, L. De Cola et al. *J. Am. Chem. Soc*. **2018**, *140*, 2355-2362.