Self-assembly of luminescent molecules in solution and in living systems

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Luminescent molecules that can undergo self-assembly are of great interest for the development of new materials, sensors, biolabels…. In some cases, the assembly can lead to an enhancement of the emission, a change in the luminescence energy and even to unexpected biological phenomena.

The talk will illustrate some of the recent results on the self-assembly of platinum complexes and their evolution in solution. The different species that evolve from the initial assembly can be visualize thanks to their different photophysical properties and the control of the solvents determines the kinetics of their evolutions. We recently demonstrated that it is possible to entrap intermediate states of luminescent assemblies using cage type structures. This stabilizes them and prevent their thermodynamic evolution towards the equilibrium state. Furthermore, the use of nanocages able to break on demand allows the transport and release in cells of such species and therefore their dynamics can be observed in living cells. Finally, some water soluble compounds where studied to follow the self-assembly in vivo and the resulting reactivity/toxicity of such species. We employed transparent polyps, Hydra vulgaris to study the self-assembly in living animals that can be monitored by the appearance of an intense green/yellow emission. Interestingly, differences in the fluorescence emissions were observed in tentacle and body regions. Also morphological or behavioural alterations where followed to understand dose dependent toxicity when the Hydra were treated with different doses of Pt(II) complex.

An extraordinary phenomenon was detected with one of the complexes that showed a clear effect on pluripotent stem cell proliferation, especially at low doses. This effect was further demonstrated by the increased number of differentiated cells, i.e. neurons and gland cells and it is still under study.

CV

https://www.decolalab.com/prof-luisa-de-cola/

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Luisa De Cola is since November 2020 Professor at the University of Milan and head of the unit Materials for Health at the Istituto di Ricerche Farmacologiche Mario Negri, IRCCS, Italy. She is also part time scientist at the INT-KIT, Karlsruhe, Germany.

She was born in Messina, Italy, where she studied chemistry. After a post-doc in USA she was appointed Assistant Professor at the University of Bologna (1990). In 1998 she was appointed Full Professor at the University of Amsterdam, The Netherlands.

In 2004 she moved to the University of Muenster, Germany. In 2012 she has been appointed Axa Chair of Supramolecular and Bio-Material Chemistry, at the University of Strasbourg. She is recipients of several awards, the most recent being the Izatt–Christensen Award in Macrocyclic and Supramolecular Chemistry (2019), the gold Medal Natta (2020). She has been Nominated "Chevalier de la Légion d' Honneur" by the President of the French Republic, François Hollande, and she is a member of the German National Academy of Sciences Leopoldina, of the Accademia dei Lincei and fellow of the American Institute For Medical and Biological Engineering (AIMBE).

Her main interests are luminescent and electroluminescent systems and their assemblies, and nano- and porous structures for biomedical applications.