NanoLab Talk

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Seminar Room 1° floor

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Push-pull porphyrins: from NLO properties to photoelectrochemical cell applications

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Porphyrins are macrocyclic compounds endowed with peculiar physical-chemical properties, which can be easily tuned by chemical modification. This feature has attracted a widespread interest for these molecules in the optical materials area and, in particular, we have investigated the second-order nonlinear optical (NLO) properties, determining the quadratic hyperpolarizability in solution, by the EFISH technique, of asymmetrically substituted *meso*- and β-pyrrolic porphyrins, with push and/or pull substituents. [1]
Push-pull *meso*-substituted porphyrins featured by a strong internal charge transfer, are also ideal candidates as dyes for dye-sensitized solar cells (DSSC)s, in fact they have reached interesting photon-to-current conversion efficiencies. However, they are obtained by multistep synthesis with low overall yields, on the contrary β-functionalized porphyrins offer the possibility of a straightforward synthesis with higher yields, and therefore more adapted for a large scale production. [2]
Here we will also present our results in the study of β-substituted porphyrins as dyes in DSSC prototype devices and in dye-sensitized photoelectrosynthetic cells (DSPECs) for water-splitting. [3]

References

[1] F. Tessore, A. Orbelli Biroli, G. Di Carlo, M. Pizzotti, Inorganics 81, 6 (2018)
[2] G. Di Carlo, A. Orbelli Biroli, F. Tessore, S. Caramori, M. Pizzotti, Coord. Chem. Rev. 153–177, 358 (2018)
[3] A. Orbelli Biroli et al., ACS Appl. Mater. Interfaces 32895−32908, 11 (2019)

About the speaker:

Alessio Orbelli Biroli is Research Scientist at the CNR and Adjunct Professor at the University of Milan. Since 2014 he is a member of the Coordination and Managing Committees of the "SmartMatLab Centre", a multifunctional laboratory and training center for the characterization and pre-applicative testing of smart materials. He obtained the degree in Chemistry and the Ph.D. in Chemical Science at the University of Pavia working in the field of supramolecular coordination chemistry. His research activity is focused on the synthesis and characterization of organic, organometallic and coordination compounds for second-order nonlinear optics, photoluminescent materials, photovoltaics and more recently for thin film surface coating and water-splitting applications.

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