

Mercoledì 13 Dicembre 2023
alle ore 11:00

presso AULA 1 Marconi dell'Edificio F
Area della Ricerca CNR di Firenze
Via Madonna del Piano 10, Sesto Fiorentino

la Dr.ssa Simonetta Orlandi
SCITEC-CNR
Via Golgi 19, Milano (Italia)

terrà il seguente seminario:

"Organic Components of Perovskite Solar Cell"

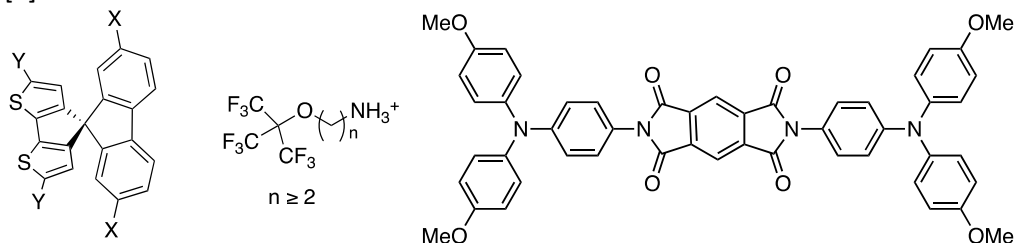
Si invitano tutti gli interessati a partecipare.

Dr. Massimo Calamante
Ricercatore ICCOM

Dr. Claudio Sangregorio
Direttore ICCOM

Short Abstract:

Hybrid organic-inorganic perovskites of various nature are actively investigated as basic components in many optoelectronic devices, because of their peculiar properties including strong light absorption properties, high charge-carrier mobility and small exciton binding energy. In particular, perovskite solar cells (PSCs) have undergone a remarkable and surprising development over a few years, with certified power conversion efficiency values (PCEs) rising rapidly from 3.8% to 26.1%. PSCs have thus the potential to complement silicon-based photovoltaic technologies. The success of PSCs is strongly related to the development of suitable organic compounds that proved to be essential in the fabrication of highly efficient devices. As a part of an ongoing research program aimed at the design and synthesis of organic compounds for PSCs, we developed different families of hole transporting materials (HTMs) based on small organic molecules, including spiro-configured molecules containing dithiophene derivatives [1] and acridane moieties.[2] A systematic investigation of PSCs featuring these HTMs has been performed and PCEs up to 22% were obtained in the case of molecules characterized by a spiro bi[acridane] core. We have also designed highly fluorinated ammonium salts and investigated their use in perovskite formulations to increase long-term stability of the material and improve device lifetime. Low dimensional perovskite arranging in 2D, Ruddlesdeen-Popper-phase were prepared, and their optoelectronic properties studied.[3] Results obtained for PSCs fabricated with one of these new ammonium salt showed an increase in device stability without detrimental effects on PCEs.[4] Recently, we have turned our attention to the use of organic additives as a strategy to reduce interface defects in PSCs. As an example, a pyromellitic derivative was found to form a stable, conductive interlayer at perovskite/HTM interface due to its ideal solubility profile allowing to reach PCEs up to 24% as well as enhanced long-term ambient stability. [5].



[1] Saliba, M. et al. *Nat. Energy*, 2016, 1501. Doi: 10.1038/nenergy.2015.17; b) Zhang, Z. *Journal of Physical Chemistry C*, 2022, 126, 18238. Doi:10.1021/acs.jpcc.2c06152.

[2] Xia, J. et al. *Angew. Chem., Int. Ed.*, 2022, e202212891. Doi: 10.1002/anie.202212891.

[3] Garcia-Benito, I. et al. *Chem. Mater.*, 2018, 8211. Doi: 10.1021/acs.chemmater.8b03377.

[4] Cho, K.T. et al. *Nano Lett.*, 2018, 5467. Doi 10.1021/acs.nanolett.8b01863.

[5] Lusheng L., et al. *Sol. RRL* 2023, 2300415. Doi: 10.1002/solr.202300415

Biographic sketch:

Bachelor's degree in Chemistry from the University of Pisa (1997), where she also obtained a Ph.D. in Chemical Sciences (2002). She conducted research as a post-doc at the University of Milan (2002-2005) and later at CNR-ISTM in Milan (2005-2008). She worked as a fixed-term researcher at ISTM-CNR (2009-2012) and has been a permanent researcher at ISTM-CNR (Milan) since 2013. She is currently a researcher at SCITEC-CNR UOS-Via Golgi since 2019.

Her research activities focus on the design, synthesis, and characterization of molecular components for the development of materials and/or functional devices for advanced technological applications in the fields of energy, sensing, and catalysis. This also contributes to the advancement of basic scientific knowledge. Specifically, her work involves the design and synthesis of organic components for perovskite-based solar cells, organic dyes for DSSC-type solar cells, bimodal fluorescence/magnetic resonance imaging ¹⁹F-NMR probes, electropolymerizable monomers, homogeneous and heterogeneous catalysts for enantioselective Carbon-Carbon bond formation reactions.