ISTITUTO DI CHIMICA DEI COMPOSTI ORGANOMETALLICI

Consiglio Nazionale delle Ricerche

Venerdì, 09/04/2021
alle ore 11.30

il Dr. Alessio Dessì
CNR-ICCOM
Firenze
terrà il seguente seminario:

# "Organic materials for solar energy conversion"

Il seminario sarà tenuto in modalità telematica, tramite accesso alla piattaforma:
GoToMeeting

Si invitano tutti gli interessati a partecipare.

Dr. Francesco Vizza
Direttore ICCOM

## Short Abstract:

Despite classical silicon-based solar cells still retain the best efficiency values in the photovoltaic scenario, the scientific research for finding alternative technologies able to convert solar energy into electric current is remarkably thriving nowadays. For example, a proper alternative is necessary for the field of building-integrated photovoltaics, where properties like transparency and color modulation are fundamental to fulfil specific aesthetic and operational conditions. Dye-Sensitized Solar Cells (DSSCs) meet many requirements in this field thanks to their low production costs, the opportunity of employing glass, plastic and flexible substrates, the almost complete independence of their efficiency from the angle of the incident light, the tunability of their color, and the possibility of producing semi-transparent devices. Among all the DSSC components, I can undoubtedly assert that the key-element of a DSSC is the photosensitizer, which can be a totally organic molecule, able to harvest solar light and start an electron-transfer process which leads to the production of electric current.

The goal of my research in this field has been the design, the synthesis, and the characterization of organic dyes able to conjugate high efficiencies in the conversion of solar light to electric current with specific light absorption properties, suitable for different applications. Particular attention has been paid not only to the product as such, but also to the synthetic procedures required for its preparation. Different Pd-catalyzed cross-coupling reactions have been considered for the preparation of the same product, searching for the most scalable and sustainable synthetic protocol. Best results have been obtained with *one-pot* direct arylation reactions, which allow introducing different organic building blocks on a central scaffold in a reduced number of steps, avoiding the use of any preformed organometallic reagent and predisposing the synthesis to an industrial scale-up.

## Biographic sketch:

Alessio Dessì studied Chemistry at the University of Pisa, obtaining his master's degree in Organic Chemistry in 2012, then, in the same year, he became a Ph.D. student at the University of Florence under the supervision of Dr. Gianna Reginato. During the Ph.D. (2012-2016), in collaboration with the Institute of Chemistry of Organometallic Compounds of the National Research Council (CNR-ICCOM), he started his work on the design and the synthesis of new organic photosensitizers for Dye-Sensitized Solar Cells, focusing his attention on both thiazolo[5,4-*d*]thiazole-based dyes for thin-layer semi-transparent devices and NIR-absorbing Pechmann dyes for blue-colored DSSCs.

After the Ph.D., he continued his research work as a postdoctoral fellow in the LEaF Lab (Light-to-Energy and Fuel Lab) at CNR-ICCOM. During this period, he developed synthetic protocols for the preparation of organic materials in accordance with the principles of Green Chemistry and he was focused on the design and the preparation of dyes for the photosensitization of $TiO_2$/Pt nanoparticles aimed at the photocatalytic hydrogen production from sacrificial donors. From 2017 to 2019, he gained a post-doc grant by Fondazione Cassa di Risparmio di Pistoia e Pescia to investigate new organic photoactive materials to make the DSSC technology compatible with the production of vegetables and plants inside greenhouses.

In July 2018, he received the "Flavio Bonati" Prize by the Interdivisional Group of Organometallic Chemistry (GICO) of the Italian Chemical Society for his contribution to the application of organometallic reactions into the synthesis of photoactive materials. In October 2019, he was awarded with the Young Investigator Award in the "Chemistry for Renewable Energy" section by the Department of Chemical Sciences and Technology of Materials of the National Research Council (CNR-DSCTM)

In 2019, he was employed as a researcher at CNR-ICCOM in Florence, where he is currently involved in the study of new organic molecules with application in photovoltaics and photocatalysis, in the development of synthetic protocols in non-conventional media, like deep-eutectic solvents (DESs), and in outreach and communication activities. Alessio Dessì (H-index = 8; total citations = 261, see Scopus) is co-author of 21 publications in peer-reviewed journals (2 publications as first author and corresponding author, 8 publications as first author) and presented his work at several national and international conferences.