UNIVERSITÀ DEGLI STUDI FIRENZE

DICUS
DIPARTIMENTO DI CHIMICA
"UGO SCHIFF"
ECCELLENZA 2023-2027

Da un secolo, oltre.

UNIVERSITÀ DEGLI STUDI FIRENZE
PhD
Chemical Sciences

# PROF. MARTA DE ZOTTI

DIPARTIMENTO DI SCIENZE CHIMICHE – DISC
VIA F. MARZOLO, 1 - PADOVA
E-mail: marta.dezotti@unipd.it

**Wednesday May 28, 2025**
**10:30**
**Aula 25 – Blocco Aule**
**Via Bernardini 6, Campus Sesto Fiorentino**

**Link for online connection**
**meet.google.com/jvt-fyzt-tab**

**will present the lecture**

## Photocurrent generation in a supramolecular DNA-inspired peptide nanowire

**organised in the context of the**
**PhD Program in Chemical Sciences**

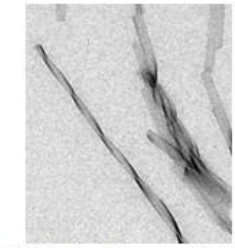
**You are kindly invited to participate**

**Prof. Dr. Anna Maria Papini**
**Coordinator of the PhD**
**in Chemical Sciences**

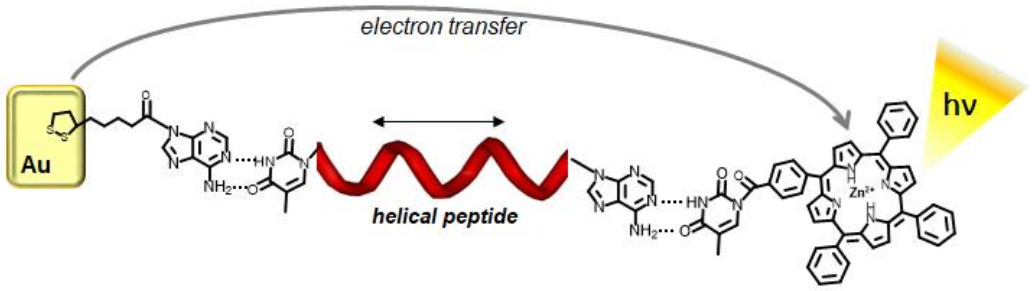
**Prof. Dr. Anna Maria Papini**
**Organizer**

**Photocurrent generation in a supramolecular DNA-inspired peptide nanowire**

In Nature, electron transfer (ET) is performed by means of biomolecules. Helical peptides are known to effectively mediate ET, acting as biomolecular wires, but they offer little stability outside their natural environment. Natural peptides based on sterically hindered, non-coded α-amino acids are biopolymers that possess - even when short - well-defined helical structures, remarkably stable under extreme environmental conditions. In this presentation, we will see how a bioinspired approach based on nucleobase pairing allows the helical peptides to self-organize into molecular wires. First, we synthesized a helical undecapeptide analog of the natural peptide trichogin GA IV functionalized with thymine and adenine at its N- and C-termini, respectively. Through thymine-adenine hydrogen bonds, we assembled the biodevice onto a gold electrode, capping it with a Porphyrin(Zn)-Adenine, also through hydrogen bonding. Under illumination, the peptide-based supramolecular system efficiently generates current [1] while remaining very stable over time, also in contact with a solution. We can modulate the photocurrent efficiency by inducing a reversible, pH-controlled $3_{10}$-helix to α-helix conversion: the pH-induced conformational change can act on the electron transfer, by changing the molecular dipole moment [2,3]. The biomolecular devices were



*TEM of self-assembled peptide wire*



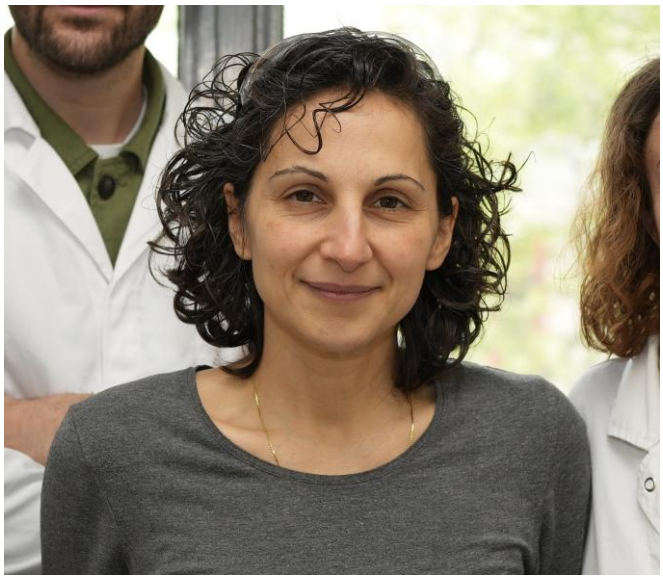

characterized by electrochemical and spectroscopic techniques, and were able to generate current under illumination, with an efficiency that is the highest recorded so far with biomolecular systems.

[1] E. Gatto, S. Kubitzky, M. Schriever, S. Cesaroni, C. Mazzuca, G. Marafon, M. Venanzi, M. De Zotti, *Angew. Chem. Int. Ed*. **2019**, *58*, 7308.
[2] S. Kubitzky, M. Venanzi, B. Biondi, R. Lettieri, M. De Zotti, E. Gatto, *Chem. Eur. J.* **2021**, *27*, 2810.
[3] S. Kubitzky, R. Lettieri, E. Passaretti, M. Venanzi, M. De Zotti, C. Mazzuca, E. Placidi, E. Gatto *Adv. Mater. Interfaces* **2025**, *12*, 2400418.

**PROF. MARTA DE ZOTTI**

**DIPARTIMENTO DI SCIENZE CHIMICHE – DISC, VIA F. MARZOLO, 1 - PADOVA**

**marta.dezotti@unipd.it**



Marta De Zotti is an associate professor at the Department of Chemistry of the University of Padova. Her research interest is focused on the synthesis of stable helical peptides of the naturally-occurring family of the peptaibols and their application in the field of biocompatible materials. In 2019 she developed peptide-based biomolecular devices in collaboration with Prof. Emanuela Gatto of the University of Tor Vergata and was recognized as a 'Young Researcher who distinguished herself in one of the various fields of science, technology or art' by the Italian Republic President Sergio Mattarella at the traditional reception for the Republic Day (June 1st, 2019). In 2020 she developed the peptide-based plant protection technology that won the first prize at the Intellectual Property Award 2021 - Agrotech sector (Expo2021 Dubai). She coauthored more than 100 publications in peer-review journals and four EU patents.

**FIVE RECENT PUBLICATIONS**

Kubitzky S., Lettieri R., Passaretti E., Venanzi M., De Zotti M.*, Mazzuca C., Placidi E., Gatto E.* A Supramolecular Wire Able to Self-Assemble on Gold Surface: Controlling the Film Length to Optimize the Device Lifetime and Electron Transfer Efficiency. *Adv. Mater. Interfaces*, *12*, 2400418 (**2025**).

Messina G.M.L., De Zotti M., Siano A.S., Mazzuca C., Marletta G., Palleschi A. Dimer Is Not Double: The Unexpected Behavior of Two-Floor Peptide Nanosponge. *Molecules*, 30, 47 (**2025**).

Fodil S., De Zotti M.*, Tundo S., Gabbatore L., Vettorazzo I., Luti S., Musetti R., Sella L., Favaron F., Baccelli I.* Multiple lysine substitutions in the peptaibol trichogin GA IV enhance the antibiotic activity against plant pathogenic *Pseudomonas syringae*. *Pest. Biochem. Physiol*., 201, 105901 (**2024**).

Bertran A., De Zotti M., Timmel C.R., Di Valentin M., Bowen A.M. Determining and controlling conformational information from orientationally selective light-induced triplet–triplet electron resonance spectroscopy for a set of bis-porphyrin rulers. *Phys. Chem. Chem. Phys.*, 26, 2589 (**2024**).

Bertran A., Morbiato L., Sawyer J., Dalla Torre C., Heyes D.J., Hay S., Timmel C.R., Di Valentin M., De Zotti M.*, Bowen A.M.* Direct Comparison between Förster Resonance Energy Transfer and Light-Induced Triplet−Triplet Electron Resonance Spectroscopy *J. Am. Chem. Soc.*, 145, 22859−22865 (**2023**).