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International Conference on MATERIAL SCIENCE AND ENGINEERING

February 24, 2022 | Webinar

Electrochemical pH control and Calibration of protons concentration using carboxyfluorescein marker

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Controlling locally produced acidity in miniaturized spaces is of high importance yielding to monitor simultaneous chemical reactions. It is one of the most important strategies in solid phase synthesis of biopolymers like peptides1 and nucleotides2. The use of these peptides in diagnostic and therapeutic applications pushes the challenge of the combinatorial chemistry to its highest. It requires fast and economic methods for the screening of these building blocks and their fabrication with high purity and efficient yields using acid/base labile protecting groups2. To meet these requirements, it is crucial to control the composition and the acidity in the fabrication medium. In our work, we aim for a new miniaturized device containing multiplexed micro reactors (of few hundred microns), each one enabling an electrochemical control of the acidity in ~ nL volumes. The control of the acidity occurs using electro-polymerizable 4-aminothiphenol molecules (4-ATP) 3, generators of free protons in the system during several minutes. The control of these electro generated protons is traceable via a fluorescent probe (Carboxyfluorescein) in aqueous and organic solvents respectively, using a Nafion layer to protect the electrodes from cross contamination. The calibration of the acidity using the fluorescence signal permits the titration and the calculations of the pka values of products in organic solvents. In the generation and control of acidity in organic solvents allow also the deportation reaction of acid-labile protecting groups4. This step is a key step in the synthesis of peptides that could be used to fabricate personalized cancer vaccines.

Biography

Janwa EL MAISS received her PhD in chemistry. She has her expertise in surface functionalization, creation of super hydrophobic and antibacterial coatings. Her First postdoctoral training allowed her to work on the functionalization and labeling of enzymes, the generation of glucose biosensors via electrochemistry and the corporation of AuNPs to the biosensor core. Lately, she joined a new team working on the functionalization of carbamates. Her key role in this project was to synthesize large scale surfactants via green chemistry, their characterization, as well as their application to cosmetic formulations. Lately, she joined her current group, where she works on the development of a prototype demonstrating a multiplexed electrochemical peptide synthesis for personalized medicine applications as well as the Development of COVID-19 plasmonic biosensor.

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