Università
Ca'Foscari
Venezia

**Dipartimento
di Scienze Molecolari
e Nanosistemi**

Via Torino 155
30172 Mestre (Venezia)

T +39 0412348535/8698
F +39 0412348517/8594

dsmn@unive.it

www.unive.it/dsmn

Cod. Fisc. 80007720271
P.IVA/VAT 00816350276

IL DIPARTIMENTO DI SCIENZE MOLECOLARI E NANOSISTEMI

ORGANIZZA LA CONFERENZA :

Soft and flexible (micro)electrodes for biomedical, diagnostic and materials research

Dr. Andreas Lesch

Ecole polytechnique fédérale de Lausanne (EPFL), Svizzera

November the 2nd , 2017
at 15:00
Conference Room – Scientific Campus

L' organizzatore
Prof. Salvatore Daniele

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Abstract

In the first part, soft probe scanning electrochemical microscopy (Soft-Probe-SECM) and its potential application as a diagnostic tool will be discussed. Soft probes consist of up to eight parallel, individually addressable carbon paste or platinum microelectrodes embedded in flexible polymers. Gentle contact mode scanning with a nearly constant working distance is achieved by bringing the probes into physical contact with the substrate. The pressure that is exerted onto the substrate surface during brushing is remarkably weak compared to contact mode probes used in alternative scanning probe microscopies. This property allows the screening of thin as well as thick tissue for skin cancer biomarkers, priorly injected nanomaterials (e.g. drug carriers) and redox active proteins.
In the second part, inkjet printing will be introduced as a powerful digital material deposition technique for the large scale fabrication of electroanalytical sensors and material libraries. Our printing platform is equipped with three parallel printheads and simultaneous and sequential post-processing techniques, i.e. UV photo-polymerization and photonic curing, respectively. Photonic curing is based on a Xe flash lamp irradiating thin films within a fraction of a second with several Joules per square centimeter radiant energy. This leads to a rapid temperature increase in the thin film in case the absorption properties of the materials inside the thin film or the substrate surface below match the lamp emission. Fully inkjet-printed sensors with carbon nanotube working and counter electrodes, Ag/AgCl quasi-reference electrodes and a dielectric layer to define accurately and reproducibly the electrode areas are produced and used for several biosensing applications. It will further be shown how combined inkjet printing and photonic curing can be applied to synthesize metal nanoparticles and material gradients directly after the controlled deposition of the corresponding precursors using a single light pulse. The obtained combinatorial libraries can then be scanned by soft probe scanning electrochemical microscopy.

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