Workshop »Coatings for Biomedical Applications«

SurfAP³®: A Desktop Plasma Printing Technology for Micrometer-Scale Surface Treatment Targeted at Biomedical Applications

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As an important part of the biomedical industry moves towards the miniaturization of certain applications, for example in the case of biosensors, bio-MEMS, implantable devices and targeted drug delivery systems, the need for surface treatment at micrometric scale plays a critical role to deliver adequate performance, biocompatibility, and functionality. Plasma-assisted surface modification processes have emerged as a powerful tool for producing surfaces with specific functionalities. In particular, atmospheric-pressure plasmas (APP) offer several advantages, including scalability, flexibility, and cost-effectiveness, without the need for vacuum equipment. However, achieving area-selective and targeted surface modification in the sub-millimeter scale using APP is still considered a challenge when no masks (shaped electrodes) are used.

Surface Atmospheric-Pressure Plasma Printing (SurfAP³®) technology is a novel direct writing flexible tool for fine surface modification at true micrometer scale. SurfAP³® stands out for its ability to produce structures with the highest resolution available for maskless APP, starting at a linewidth resolution of 50 µm. It uses state-of-the-art plasma sources that allow activation, deposition of functional thin films, fine cleaning and layer removal, with low gas and power consumption, on multiple materials such as silicon wafers, paper, glass, and polymers. By permitting tuning of the process parameters, the open-source use of precursors and the integration with other technologies, industries and researchers can adjust the platform to their needs and their current processes, solving the previously unmet need for high resolution flexible plasma treatment without the use of masks.

This talk will introduce possible use cases and examples of how the SurfAP³® technology can be used for biomedical applications, such as for preparing biosensing surfaces, treatment of microfluidic channels, functional 3D printing, area-selective cell growth and removal of thin films, among others.