

# Lotus-Leaves-Like tailored surfaces tune the structural configuration of bio-soft matter compounds

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In the last decade there have been several advances in the characterization of biomedical compounds combining the versatility of microfluidic devices with analytical techniques capable of probing structural and spectroscopic transformations. The aim of this presentation is to give a comprehensive overview of some recent studies on bio-analytes embedded in a droplet environment by exploiting micro- and nano-structured surfaces<sup>1-3</sup> in open geometry. Taking inspiration from the natural features of Lotus leaves it is possible to fabricate, by means of optical lithography and plasma etching processes, polymeric<sup>2-4</sup> and Si-based<sup>1</sup> artificial replica of such superhydrophobic surfaces which can also include active components for droplet merging<sup>5</sup> (Electrowetting on Dielectrics-EWOD devices). These supports have been used in combination with synchrotron radiation (Small and Wide Angle X-ray Scattering) and spectroscopic techniques (Raman, FTIR) to obtain accurate structural information of biological phenomena such as protein conformational changes<sup>2,6</sup>, amyloid fibrillation<sup>7-10</sup>, DNA-filaments NOC (Network on a Chip)<sup>3</sup> and cell exosomes discrimination<sup>11</sup>. More recently the field of application of such supports has been extended to living matter with the realization of novel SU8, polymethylmethacrylate (PMMA) and polycaprolactone (PCL) nanostructured surfaces<sup>12</sup> for monitoring the growth and proliferation of cells and neurons.

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<sup>3</sup> E. Miele, A. Accardo et al., *Small* **11**(1), 134 (2015)

<sup>4</sup> A. Accardo et al., *Microel. Eng.* **88**(8), 1660 (2011)

<sup>5</sup> A. Accardo et al., *Lab Chip* **13**, 332 (2013)

<sup>6</sup> A. Accardo et al., *Soft Matter* **7**, 6792 (2011)

<sup>7</sup> A. Lakshmanan, D.W. Cheong, A. Accardo et al., *PNAS* **110**(2), 519 (2013)

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<sup>11</sup> A. Accardo et al., *Nanoscale* **5**, 2295 (2013)

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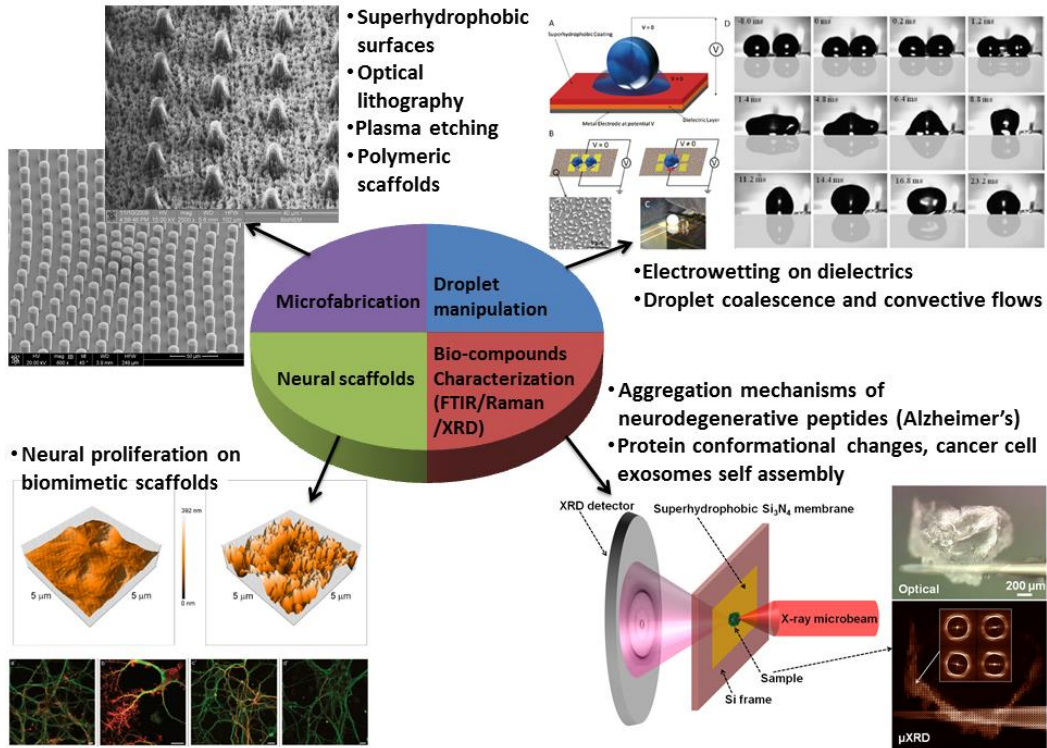


Figure 1. Scenario of the life-science applications involving the use of Lotus-Leaves-Like tailored surfaces.