## TS41
## Superhydrophobic surfaces produced using natural silica-based structures with potential for biomedical applications

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Superhydrophobic surfaces (SHS) are characterized for exhibit extreme water repellency. Where water droplets roll easily and have a contact angle higher than 150º. The inspiration to produce artificial SHS comes from nature, the Lotus leaf. Hierarchical surface topographies at micro/nanoscale are critical for this effect. On biomedical and tissue engineering fields several applications for SHS has been developed. Such as microfluidic platforms to perform studies in mimic *in vivo* environment similar to human body.[1] SHS are also used to produced spherical particles without using any precipitation bath. The method permit to produce particles for controlled drug delivery in one step with high encapsulation efficiency.[2] Cells was also encapsulated and a system to be used in tissue regeneration was obtained.[3] Other promising application for SHS is high-throughput screening. Using SHS, platforms to analyze several materials/formulations at the same time were developed. These platforms permit to perform combinatorial studies with cells/biomaterial to screen cytocompatibility.[4] Several strategies were developed to produce SHS: polymer reconformation, template method or sol−gel processing. One strategy involves producing roughness by silica micro/nanoparticles deposition on glass slides. Other is to use natural structures as templates that exhibit the necessary hierarchical structure.These two strategies inspired us to develop a new approach to generate SHS. We use silica-based structures already available in nature to create the necessary hierarchical topography. We use diatomaceous earth directly on the surface and not as templates. The diatomaceous exoskeletons are microstructures with nanotextures. These microstructures were used to coat smooth surfaces and create a hierarchical roughness on surfaces. By fluorosilanization a SHS was achieved. The wettability of the produced surfaces can be precisely controlled by exposing the substrates to plasma treatment for specific times. The control in space of the treatment can be used to imprint hydrophilic patterns on the SHS. This make promising the use of developed SHS in several of the above cited applications. The developed strategy can be applied in different kinds of substrates. The versatility of the developed method to produce SHS show high potential for biomedical and tissue engineering applications.

*References:*

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## TS42
## Magnetic nanoparticles potential for stem cell functionalization

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Stem cells have the capacity to migrate within tissues to damaged areas. The ability to remotely monitor and manipulate cells encouraging their precise positioning to desired sites for tissue regeneration would have a potential impact in tissue engineering and regenerative medicine. Cell monitoring and cell localization can be potentially achieved by the internalization of magnetic nanoparticles (MNPs) in the cells. This might allow for the investigation of migratory patterns through tracking studies, the targeting of particle-labeled cells to desired locations via the application of an external magnetic field and, finally, for activation stem cells to initiate various cellular responses to induce the differentiation [1]. The application of a magnetic field can then enhance biological performance through the stimulation of cell proliferation, migration and differentiation. This study focus on determining the effect of magnetic stimulation in human adipose stem cells (hASCs) behavior in order to establish the interactions between MNPs uptake by the cell, the MNPs concentrations, and magnitude/frequency of the external magnetic field during the internalization process. hASCs cells were seeded onto 24-well plates at a density of 50.000 cells per well and incubated with commercial red-fluorescent crosslinked magnetic dextran nanoparticles (nanomag®-CLD-redF, Micromod), at different concentrations, with and without magnetic stimulation provided by a magnefect nano device for up to 16 h. MNPs internalization into cells was confirmed using fluorescence microscopy, cytometry analysis and prussian blue staining for iron detection. Cellular viability of hASCs was also assessed through time in magnetically stimulated cells and compared to unstimulated hASCs. Results indicate that MNPs were successfully internalized in hASCs. It is possible to detect MNPs inside hASCs by fluorescence microscopy as well as by flow cytometry. Prussian blue staining also indicates that the detection of ferric iron is more intense for longer incubation periods under magnetic stimulation. Cell metabolic activity seems not to be affected by the increasing concentrations of MNPs and tends to increase with incubation time. MTS assay also show an increment in cell viability levels when the magnetic stimulus is applied. Further, higher concentrations of MNPs did not negatively influence hASCs viability, but longer periods of culture are needed to verify MNPs influence in stem cell behavior, especially in terms of cellular proliferation and differentiation processes. In summary, these MNPs have the potential to be used in stem cell therapy without affecting cell viability and functioning, as a promising tracking and/or functionalization tool.

*Reference:*

1. Wimpenny *et al*. SCRT 2012, 3:13.

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