Joanna Raczkowska et al., J Biotechnol Biomater 2016, 6:1(Suppl)
http://dx.doi.org/10.4172/2155-952X.C1.050

OMICS International
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Annual Conference and Expo on
Biomaterials

March 14-16, 2016 London, UK

Physicochemical properties of PDMS surfaces suitable as substrates for cell cultures

Joanna Raczkowska[1] and **Szymon Prauzner-Bechcicki**[2]
[1]Jagiellonian University, Poland
[2]Institute of Nuclear Physics Polish Academy of Sciences, Poland

Elastic properties of the substrate have profound effect on adhesion and proliferation of cells. Here, we introduce the method to produce polydimethylsilane (PDMS) substrates with monotonically tuned stiffness, adjusted by the time of UV irradiation. The Young's modulus (determined by using nanoindenter) scales linearly with stiffness calculated using AFM based force spectroscopy data. Such relation enables to determine the Young modulus from AFM force distance curves also when the Herz model is not applicable. To verify, whether the applied way of stiffness tuning changes or not, the surface chemistry, the surface of PDMS substrate was studied using Fourier Transform Infrared (FTIR) and X-ray photoelectron (XPS) spectroscopies. Such complex approach enabled deep insight into chemical surface properties of the produced PDMS substrates. Knowing that cellular response depends on surface wettability surface energy was determined using contact angle measurements. The obtained results suggest that surface chemistry is not affected by the presence of benzophenone and UVA exposure. Finally, the MTT proliferation assay was used to quantify the human bladder cells (non-malignant epithelial cells of ureter HCV29 and transitional cell carcinoma T24) viability, proliferation and PDMS surface cytotoxicity by analyzing metabolic activity of cells. The delivered results showed that softer PDMS substrates were characterized by high level of cytocompatibility whereas the stiffer ones were more cell-repellent.

Biography

Joanna Raczkowska works at Jagiellonian University in Krakow, Poland in Macromolecular Nanofilms Laboratory. Most of her scientific interests concerns polymer films for biomedical applications. Her research focused on two main subjects: Physicochemical properties of stimuli-responsive polymer-based brushes and the cellular response of cancerous cells to the mechanical properties of elastomer fims with tunable stiffness.

joanna.raczkowska@uj.edu.pl

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