

Impinging jet technique as an effective tool for measuring and quantification of cell adhesion on graphene-based materials

Jakub Vlček

Lubomír Lapčák
Michal Otyepka
Markéta Havrdová

Regional Centre of Advanced Technologies and Materials, Department of Physical Chemistry, Faculty of Science, Palacký University, 17. Listopadu, 1192/12, 771 46 Olomouc, Czech Republic

Jakub.vlcek@upol.cz

Study of the cell adhesion is important in many biological and biotechnical processes, especially for biosensors, where cell adhesion play a crucial role in final efficiency. Recently much attention has been focused on the research of cell adhesion of cancer mammalian cells in pharmaceutical and biomaterials industry, especially in connection with graphene-based nanomaterials. This study was focused on measuring of cell detachment kinetics from graphene and graphene oxide (GO) surfaces using stagnation point flow in impinging jet apparatus. It was found, that cell detachment process induced by force (9,4) nN has a three-step character on graphene substrate and two-step character with evident elongation of time on GO surface. This study conclusively demonstrates that hydrophilic functional groups in GO are potent HeLa cell adhesion enhancers. Additionally, it was observed that cells with smaller spread area on graphene surface are detached later than larger cells. According to the results, the impinging jet method is a powerful technique for studying cellular detachment mechanism and adhesion strength and could be useful for studying interactions between cells and graphene-based materials.[1]

References

- [1] J. Vlček, L. Lapčák, M. Havrdová, K. Poláková, B. Lapčíková, T. Opletal, J.P. Froning, M. Otyepka, *Nanoscale* 2019 3222–3228

Figures

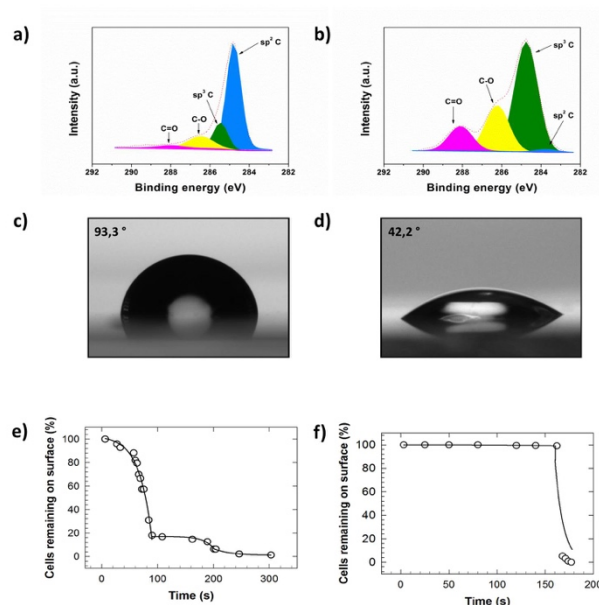


Figure 1: Measured and fitted high resolution C 1s XPS spectra of graphene (a) and GO (b); sessile drop contact angle of wetting for water on graphene (c) and GO (d); impinging jet detachment kinetics of HeLa cells on graphene (e) and GO (f) surfaces.[1]