

UV-induced modification of dielectric properties of polymers for surface patterning controlling cell adhesion and photonic applications

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The effects of photochemical modifications of polymer surfaces on the competitive adsorption of serum proteins and cell adhesion (hepatoma cell line HepG2, L929 fibroblasts, see Fig 1) have been studied. Masked UV irradiations ($\lambda=185\text{nm}$, in air) of polystyrene (PS), poly(methylmethacrylate) and polycarbonate lead to partial carboxylation and alter the physico/chemical properties of the polymer surfaces affecting the composition of the adsorbate formed by competitive adsorption of serum proteins and finally leads to the formation of micrometer scaled cellular patterns in vitro [1]. Using a quartz micro balance technique capable to extract viscoelastic data in addition to the mass load of the polymer coated sensor, the importance of the thickness and the viscosity of an albumin adsorbate on the modified polymer surfaces for the observed cell adhesion in vitro is demonstrated. The quantity and viscosity of surface bound albumin on PS, being a cell repellent material in its native state, is lowered when the surface is exposed to UV prior to the contact with albumin solutions or cell culture media. This promotes the deposition of cell adhesion proteins and explains the observed cell patterns. Using adapted techniques it is possible to create protein patterns of defined composition.

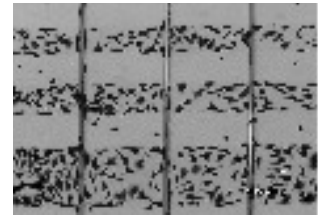


Fig 1. Photograph of living cells structured perpendicular to optical waveguides.

The technique described for the patterning of cell adhesion can also be used to create single mode planar optical waveguides (Fig. 1) and devices [2]. The process is based on UV-induced modification of the dielectric properties of methylmethacrylate polymers. This offers the possibility to realize biophotonic sensors which allow the non invasive on line monitoring of anchorage dependent cells.

Literatur

- [1] A. Welle and E. Gottwald, "UV-based patterning of polymeric substrates for cell culture applications," *Biomedical Microdevices*, vol. 4, pp. 33-41, March 2002.
- [2] D. G. Rabus, P. Henzi, J. Mohr, "Photonic Integrated Circuits by DUV-induced Modification of Polymers," accepted for publication in *IEEE Photon. Technol. Lett.*, vol. 17, no. 3, March 2005.