

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

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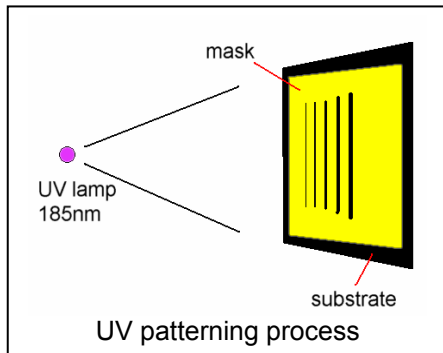
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Motivation

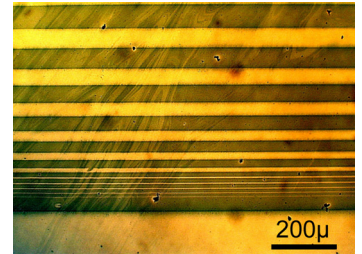
Patterned arrays of living animal cells are essential for studies of a variety of defined cell (co-)cultures, cell differentiation, intercellular communication and for engineered tissues as highly functional bioartificial organs for therapy and drug research.

Cell Patterning



UV irradiation induces:

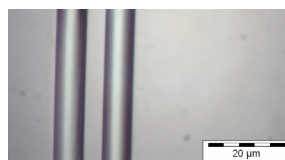
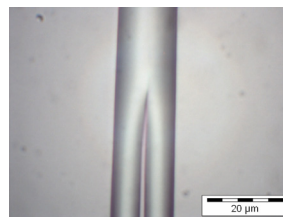
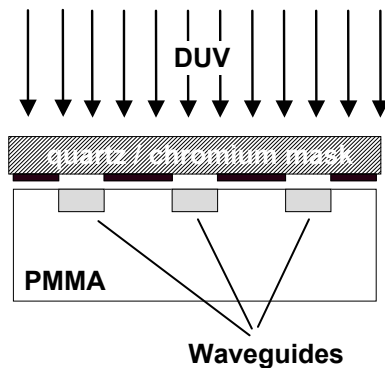
1. The formation of peroxides at the polymer surface allows graft coupling. Peroxides decompose within a couple of days during storage.
2. Formation of carboxylic acids affect cationic dye binding, wettability and surface energy contributions.
3. Surface ablation. Due to corrosion at longer irradiation times, a constant COOH surface density is obtained at $t > 60$ minutes. Carboxylic acids groups were found to be stable for shelf lives of several months.



BSA detection by immuno staining (blue). Irradiated regions appear light, i.e. albumin poor.

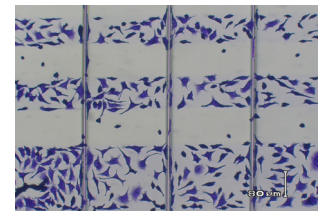
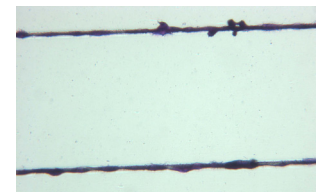
Waveguide Fabrication

Change of refractive index by DUV - exposure of PMMA



Optical waveguide components

BioPhotonic - Integration



Stained L929 fibroblasts and optical waveguides for cell on line monitoring

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," *IEEE Photon. Technol. Lett.*, vol. 17, no. 3, pp. 591-593, March 2005.