

Photochemical Immobilization of Polymer Thin Films on Solid Substrates

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The attachment of polymer thin films on solid materials is an effective way to tailor the chemical and physical properties of the surface layer, and to introduce functions to materials. We have developed two methods for the immobilization of polymer thin films on solid substrates. In the first approach, a heterobifunctional crosslinking agent was used to covalently immobilize polymer thin films.¹ The immobilization chemistry is based on the C-H/N-H insertion reaction of perfluorophenyl nitrenes that are generated by either photochemical or thermal activation. The method does not require special functional groups on the polymer and is therefore versatile and general. The morphology of the attached polymer can be controlled through surface and interface engineering.² Examples will be given on the construction of micro/nanowell arrays with precise controls over the functionality and topography of the features,³ covalently tethered single polymer molecules,⁴ and carbohydrate microarrays.⁵

The second method developed is the direct attachment of polymer thin films by UV irradiation.⁶ The procedure consists of spin-coating a polymer film onto a substrate followed by UV irradiation and solvent extraction. The thickness of the film can be controlled by varying solution concentration or the molecular weight of the polymer. Applications of this method in the fabrication of stimuli-responsive polymer films⁷ will be presented.

References:

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