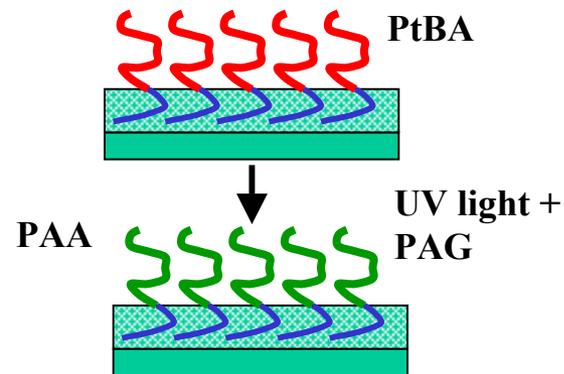


Switching Polymer Surface Chemistry with Light

Jeffrey T. Koberstein, Columbia University, DMR-02-14363

Many industrial applications of polymers call for the control of the chemical nature of their surfaces. We have invented a simple yet quantitative means to control the number density and spatial distribution of reactive chemical groups at a polymer surface. The basis of the approach is to synthesize a block copolymer wherein one block contains protected functional groups. The protection strategy imparts low surface tension to that block and causes the block copolymer to self assemble from a supercritical CO₂ solvent as a bilayer on the surface of a polymeric substrate. The surface is rendered functional, in micron scale patterns if desirable, simply by exposure to UV light, a process that deprotects the functional groups. This approach is used to create carboxylic acid groups at surfaces to which various biological molecules can be attached and patterned.



Switching the surface chemical nature of a polymer from hydrophobic poly(tert-butyl acrylate) to reactive poly(acrylic acid), a polyelectrolyte, by exposure to UV radiation



A 150 micron periodic pattern of carboxylic acid groups on a poly(tert-butyl acrylate) background imaged by water condensation.

Switching Polymer Surface Chemistry with Light

Jeffrey T. Koberstein, Columbia University, DMR-02-14363

Education:

Two students have completed their PhD research under support from this research grant. Derek Wong (PhD University of Connecticut) has joined Columbia University as a postdoctoral associate studying “click” chemistry for the attachment of DNA to surfaces, and Peng Wang has accepted a postdoctoral appointment at the University of Michigan to study the modification of biomaterial surfaces. One chemical engineering undergraduate, Mr. Goonjan Shah has spent one year of independent studies examining the self assembly of polyelectrolytes onto patterned surfaces of polyelectrolyte brushes.

Outreach:

The PI was a fellow of the Japan Society for the Promotion of Science for two months at Kyushu University where he presented a course on polymer surface properties and gave several research lectures throughout Japan. The photo shows the PI and his wife, far right, with (from left to right) Prof. Takahara, Kyushu University President Kajiyama and his wife.

