

## *Testing Self Healing Properties in Polymers*

Hamsini Gopalakrishna, Purdue University and John Blendell, Purdue University

Mussels and barnacles have the ability to stick to underwater surfaces with the help of a cross-linked protein structure. Reduction in the plastic consumption can be achieved by using toughened polymers. Synthesized cross-linking polymers can be used for underwater adhesion by mimicking the protein structure used by mussels and barnacles. One such polymer is poly(3,4-dihydroxystyrene-co-styrene) having enhanced toughness. Traditionally, blister tests measure the adhesion between a substrate to a surface but this was modified to serve as the driving force to drive crack propagation in controlled flaws. The modified blister tests were carried out on polystyrene (PS) samples. Once the method of controlled crack propagation was perfected, the testing was extended to samples of the copolymer of styrene and 3,4-dihydroxystyrene. Samples were made in aluminium pans by solution casting PS in toluene and drying them in an inert oven. Melting PS pellets in the pans directly on a hot plate at 350°F is another way of making samples. The samples were indented with a Vickers micro-hardness tester. Samples were pressurized and changes in crack size and geometry were monitored via optical microscope. The parameters for successful control of crack growth such as sample thickness, air pressure and exposure time were optimized. These parameters will be used to consistently test and study samples for controlled crack growth. This is a part of the ongoing research about toughened polymers.