



Editorial

Stimuli Responsive Polymers

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“Stimuli-responsive”, “smart”, or “intelligent” polymers are those able to modify their physical-chemical properties in response to the variation of environmental factors. Stimuli-responsive systems can be designed to respond to a wide range of external variables, such as changes in temperature, ionic strength, pH, electric and magnetic fields, or light. These polymers can respond to stimuli in several ways by altering shape, solubility, wettability, color, conductivity, light transmitting abilities, and surface characteristics when a stimulus or stimuli are applied. The degree of response of such polymers can be triggered and controlled by the intensity of the applied stimuli. Typically, the changes are limited to the formation or removal of secondary forces, such as hydrogen bonding, hydrophobic effects, osmotic pressure, electrostatic interactions, etc. Based on the structure-property relationship, synthetic and modified natural polymers have been obtained with well-controlled composition and architecture. Due to their well-controlled properties, stimuli-responsive polymers can be potentially utilized in many fields such as water treatment, enhanced oil recovery, catalysis, separation processes, etc. Smart polymers have

also been useful as drug delivery systems and in the biotechnological field for enzyme immobilization. Although more recently, coating medical devices with stimuli-responsive polymers may significantly widen their range of applications. Devices able to attract/repel certain cells of the body (e.g., for prevention of inflammatory responses or behaving as tissue scaffolds), or devices that should perform as membranes or artificial muscles take advantage of these smart materials. A surface grafted with stimuli-responsive polymers has been highlighted for its interfacial and wetting applications. Temperature and pH stimuli-responsive macromolecular materials have attracted great attention because of their obvious applications in biomedicine and biotechnology. Temperature-responsive polymers change their properties due to a variation in the environmental temperature. Temperature-responsive polymers undergo an abrupt decrease in physicochemical properties above a certain temperature which is named as the lower critical solution temperature (LCST). The pH-responsiveness is due to the presence of ionizable pendant groups in the polymer backbone. When exposed to an aqueous solution of an appropriate pH, these pendant groups ionize giving as result the formation of a fixed charge along the polymer. These smart polymers are of particular interest for biomedical applications due to several locations in the body exhibit substantial pH changes during either normal function or as part of a disease state.

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