Editorial

# Smart Polymers for Biomedical Applications

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Structural components of all living cells are polymeric, i.e., proteins, carbohydrates, and nucleic acids are essentially polymers. Nature uses polymers for making as well as running of the complicated cell machinery. Living systems respond to environmental conditions to accommodate their structure and functionality to variations in nature through the action of complex sensing mechanisms, actuating and regulating functions, and feedback control systems.[1] Therefore, human body can be regarded as a laboratory where materials with dynamic and tunable properties mimicking surrounding microenvironments are developed and disposed.

Smart biopolymers are gaining attention due to the significant advancement made by scientists in materials chemistry and triggers that induce conformational changes in polymer structures for specific biomedical application.[2] The salient feature of functional biopolymers is their ability to be "stimulus responsive" or "smart" which makes them undergo strong conformational changes when they are exposed to subtle changes in their surrounding (e.g., pH, ionic strength, temperature, electric or magnetic fields, light intensity, biological molecules, etc.). The magnitude of their conformational change can be "all-or-nothing" or "highly non-linear."[3]

Smart biopolymers have found critical biomedical applications such as insertion of self-inflating bulky medical devices by minimally invasive surgery.[4]

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Researchers are now exploring natural polymers, such as alginate, to develop new smart biomaterial such as pH-sensitive hydrogels for application in drug delivery and tissue engineering. pH-sensitive drug delivery platform can be used to deliver low-molecular-weight protein drugs in the gastrointestinal tract.[5] In the tissue engineering application, pH-sensitive hydrogels can help in improving the biocompatibility by imitating the characteristics of the cell surface in vertebrates, thus minimizing immunogenic effects.[6]

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