

Stimuli-sensitive Biomaterial System for Regenerative Medicine

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Most polymers used in medical applications today are materials that have been developed originally for application areas other than biomedicine. Not all potential biomedical applications can successfully be realized using the existing materials. This finding resulted in a targeted development of new implant materials.

An actual trend in polymer science is the design of materials which show multifunctionality meaning an unexpected combination of material functionalizations like the combination of biofunctionality, hydrolytic degradability, and shape-memory functionality. The introduction of biodegradable implant materials as well as minimal invasive surgical procedures in medicine has significantly improved health care within the last decades.

This paper describes a group of degradable polymers, which are able to change their shape in response to an increase in temperature or a irradiation of a specific wavelength. The shape-memory effect results from the polymer's structure and morphology in combination with a certain processing and programming technology. A substantial development in this context is the introduction of polymer systems in which macroscopic properties can be tailored over a wide range for a specific application. Their mechanical properties and degradation rate can be tailored by variation of molecular parameters. Their shape-memory capability enables bulky implants to be placed in the body through small incisions or to perform complex mechanical deformations automatically. A smart, degradable suture visualizes performance and potential of these shape-memory plastics in biomedical applications.