

Shape-memory polymer

Shape memory [polymers](#) (SMPs) with multiple functionalities have great potential in [implantable biomedical devices](#), especially vascular [stents](#). However, stents made of SMPs are generally faced with the problem of insufficient radial support due to the sharp decline of the modulus after shape recovery. Therefore, it is necessary to improve the modulus of SMPs after opening the narrow part by other means. In this study, the novel SMPs available for vascular stents were developed with impressive water-induced stiffening when the shape recovered in a physiological environment. Herein, a series of shape memory [polyurethanes](#) (SMPUs) containing full hard segments on the main chains and bearing hydrophilic tertiary amine soft segments on the side chains were synthesized. When immersed in water, the soft segments were dramatically separated from the hard segments, which were aggregated more to form densely packed hard domains with stronger hydrogen bonding and higher crystallinity. Both Young's modulus and the shape recovery ratio were thus promoted due to the segmental rearrangement in water. At the same time, hydrophilic side chains migrated to the surface driven by the segmental rearrangement in water, which promotes the adhesion and growth of vascular endothelial cells and inhibits the activation of the coagulation system. The ingenious structural design provided SMPUs with adequate mechanical strength and hemocompatibility to qualify for potential applications in self-expanding vascular stents ¹⁾.

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