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标题: 3D printing of structural gradient soft actuators by variation of bioinspired architectures

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摘要: Soft actuators, which ensure the safety of robot-human interactions, extend the range of robotic operations to fragile and sensitive objects. Shape memory polymers are one of the building material for soft actuators due to their spontaneous shape memory properties under stimulation. However, the global, discontinuous and imprecise motion put significant limitations on their wide application. Recently, it has been demonstrated that by using motifs in nature, anisotropic, heterogeneous properties of soft actuators can be fabricated. Here, it is shown that soft actuators with local response and continuously varying shape memory properties can be realized through integrating bioinspired arranged building blocks (fibers). The modified 3D printing technique provides the pathway of assembling these fibers as designed. We have revealed the underlying mechanism of the formation of gradient shape memory properties. Simulations successfully demonstrate the feasibility of our approach to manipulate shape memory behaviors. The translation of nature's design motifs offers synthetic soft actuators the opportunity towards unprecedented applications such as soft robot, drug carrier and other intelligent applications.

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