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Preface

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Special Topic: 4D Printing of Stimuli-Responsive Materials
•Editorial•

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Stimuli-responsive materials, such as shape memory polymers, shape memory alloys, hydrogels, liquid crystal elastomers, are capable of changing shapes or sizes when subjected to external stimulus. In addition to the application fields in intelligent textile, tactile display, biomedical device and self-healing system, stimuli-responsive materials show great potential in aerospace field. Various deployable structures have been performed spaceflight experiments. To our knowledge, the first verification in low earth orbit was carried out by the Composite Technology Development Inc., in 2006; the recent one is the first geostationary orbit experiment conducted by a team from Harbin Institute of Technology (HIT) in 2016. In 2013, smart material additive manufacturing technology emerged. With the addition of fourth dimension—time, 3D printing process has been extended into 4D printing, which allows the development of "living" adaptable structures from stimuli-responsive materials. 4D printing makes the preparation of complex structure possible, and the obtained structure is intelligent and can respond to external changes. One typical example is the 4D-printed biodegradable and remotely controllable shape memory occlusion device developed by a HIT team. The 4D printing technology simplifies the production process and accelerates the manufacture of complex shapes and structures. It can be expected that the advanced printing technology will bring more opportunities for smart production in the future.

I wish to express my sincere thanks to Prof. ZHANG TongYi for inviting me to organize this special topic on 4D Printing of Stimuli-Responsive Materials. This special issue mainly focuses on the advanced scientific and technological progress and achievements in this field. These articles should cover the features of stimuli-responsive materials, actuation methods, concept of 4D printing, 4D printing technology, structural design, mechanical behavior and potential applications. 4D printing of stimuli-responsive materials can realize the complex, programmable, customized and personalized manufacturing of intelligent structures and devices, and will promote the leapfrog development of biomedical, aerospace and automobile manufacturing fields. I really appreciate all the authors for contributing their efforts and valuable time to this special issue.

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