



## Sustainable 3D/4D Printing Systems, Materials, and Applications

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### Message from the Guest Editors

Dear Colleagues,

One of the extraordinary advances in technologies and applications concerning additive manufacturing (AM) that has been reported so far is four-dimensional (4D) printing, in which three-dimensional (3D) printing technology is combined with smart materials (SMs) to produce structures that change shape over time in response to external stimuli such as temperature, electricity, humidity, solvents, pH, or light. In other words, time could be considered as the 4th printing dimension where the developed 3D system can self-morph, self-transform, self-regenerate, adapt, evolve, or respond. 4D printing is expected to play a crucial role in future designs due to its obvious advantage of creating engineered and natural systems that are socially, environmentally, and economically sustainable. For instance, 4D printing may allow scientists to develop micro/nano-actuators, sensors, microfluidics, energy harvesters, smart solar panels and wind turbines, and energy conversion devices that efficiently reuse thermoplastic materials, aid in waste management efforts, and reduce energy consumption towards greater sustainability.





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