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## Recent advances of functional gels controlled by pillar[*n*]arene-based host–guest interactions

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### ABSTRACT

Functional gels fabricated from supramolecular host–guest interactions exhibit outstanding characteristics including stimuli-responsiveness, self-healing and adaptability. Pillar[*n*]arenes are new generation of supramolecular macrocyclic host, which displayed excellent host–guest recognition properties. In the last few years, pillar[*n*]arene-based gels that include both hydrogels and organogels have been attracted more and more attention. In this digest, the recent advances in this field are reviewed, with special emphasis on the multistimuli responsive pillar[*n*]arene gels. It is anticipated that more and more pillar[*n*]arenes-based gel materials with smart properties will be developed in the near future.

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### Introduction

In the past decades, gels have been extensively studied due to their outstanding properties and wide application in materials science and bioscience.<sup>1</sup> Generally, gels are a type of soft materials which have solid-like rheology and do not flow. Moreover, gels consist a large amount of liquid (water or organic solvent) which is held together with a network formed by polymers or low molecular weight gelators. Thus gels could be classified in several ways depending on the nature of the liquid or their structural characteristics. From the perspective of what kind of liquid the gel contains, the gel can be divided into two main groups, namely hydrogel or organogel which are swollen networks containing water or organic solvent respectively. In

addition, from the point of the network formation, we can distinguish gels into three categories<sup>1d</sup>: (1) gels in which the networks are formed by chemically cross-linked polymers; (2) gels in which the networks are made by physically (non-covalently) cross-linked polymers; (3) gels derived from low molecular weight gelators which can self-assemble into fibrous gel networks. Different types of gels have different properties and are suitable for different kinds of application requirements. A special type of gels are named smart gels, whose sol–gel transition or expansion–contraction behaviors are responsive to external stimuli including pH, temperature, light, redox, and pressure.<sup>1c-e</sup> Moreover, some smart gels displays some other intelligence properties, such as self-healing, injectable and adaptability.<sup>1a, 1c, 2</sup> These type of smart gels have been widely

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