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Nature-inspired multifunctional membrane fabricated by adaptive hybridization of PNIPAm and PPy.[1] HYEJEONG KIM, KIWOONG KIM, SANG JOON LEE, Department of Mechanical Engineering, Pohang University of Science and Technology, Pohang, 790-784, Republic of Korea — Specialized plant organs, such as guard cells of stomata, consist of soft materials with deformability and electrochemical properties in response to various environmental stimuli. Stimulus-responsive hydrogels with electrochemical properties are good candidates for imitating such functionalities having great potential in a wide range of applications. However, conductive hydrogels are usually mechanically rigid and the fabrication technology of structured hydrogels has low reproducibility. Here, inspired by stimulus-responsive functionalities of plants, a thermo-responsive multifunctional hybrid membrane (HM) is synthesized through the in situ hybridization of conductive poly(pyrrole)(PPy) on a photopolymerized poly(N-isopropylacrylamide)(PNIPAm) membrane. The various properties of the HM are investigated to characterize its multiple functions. In terms of morphology, the HM can be easily fabricated into various structures, and exhibits thermo-responsive deformability. In terms of functionality, it exhibits various electrical and charge responses to thermal stimuli. This simple and efficient fabrication method can be used as a promising platform for fabricating a variety of functional devices, such as actuators, biosensors, and filtration membranes.

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