

Commentary on Covalent Tethering of Photo-responsive Superficial Layers on Hydrogel Surfaces

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Hydrogels are widely used in the field related to biological medicine, such as drug carrier and drug delivery vehicle due to their excellent biocompatibility [1]. In the last two decades, hydrogels with diverse stimuli responsiveness were developed and utilized to construct the controlled release systems. However, conventionally strategies that are reported to prepare stimuli-responsive hydrogels usually suffer from complex preparation procedures [2-4] and the using of sol-gel transition process of the hydrogel to realize the controlled release would inevitably lead to the burst release [5-7]. Overcoming these limitations, we report a post-modified hydrogel with photo-controlled release property by covalent tethering of photo-responsive superficial layers on hydrogel surfaces in *Chemical Science* [8].

Despite the great efforts in the development of controlled release of hydrogels, the fabrication of stimuli-responsive hydrogels for controlled release without changing the intrinsic superhydrophilicity and biocompatibility of the hydrogel network remains challenging. The focus for us is the development of superhydrophobicity on hydrogel surfaces, creating asymmetric wettability across the surface and the inner network. To achieve this goal, the n-alkylation reaction is introduced in our work to modify hydrogel surfaces. By taking advantage of the oil/water repulsive interaction, the surface modification was confined at the hydrogel/oil interface. The introduction of photo-responsive molecule 1-(4-Iodobutyl)-3,3-dimethylindoline-6-nitrobenzospiropyran (IBSP) as modifier endows the as prepared hydrogel with photo-responsive tunable surface wettability.

The as prepared IBSP-modified hydrogel was superhydrophobic. "It was supposed that the superhydrophobicity of the hydrogel was attributed to its surface composition and surface roughness", explains in the original article. Besides, the IBSP was not just formed a monomolecular layer on hydrogel surfaces after modification as we through. The results showed that a photo-responsive superficial layer with limited thickness (within 1.3 μM) was formed on the hydrogel surfaces, which was explained as "The oil phase (dichloromethane) used in this work was not perfectly immiscible with water and give rise to the modifiers dissolved in oil being able to penetrate into the hydrogel and graft onto the polymer network."

This superhydrophobic photo-responsive superficial layer that

generated on hydrogel surface showed significant influence on diffusion and exchange of substances across the surfaces of hydrogel. Most importantly, the IBSP-modified hydrogel was demonstrated can be used as drug carrier for controlled release, from which the diffusion rate of substances can be controlled by light illumination.

It is worth to point out that the method used in this work is a universal strategy to functionalize the surfaces of synthetic hydrogels [9]. Consequently, the development of other functional modifiers will further broaden the list of functional hydrogel and expand into diverse complicated biomedical and practical applications that may not be appropriate for the classical homogeneous bulk hydrogel.

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