Photoswitchable peptide-based hydrogel for dynamic control of cell fate

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Biomimetic and dynamic nature of peptide-based materials offers unprecedented advantages for cell biology, the precision control of supramolecular structures and mechanics remains challenging.[1, 2] Here, 9 peptides with azo-compounds-modification are synthesized and shown to form a hydrogel. The photoswitching of our hydrogels with light results in *gel*-to-*sol* changes or significant softening of the hydrogel, depending on the molecule use. Photoinduced morphological changes are revealed by *cryo*-TEM and AFM, showing significant 'thinning' of supramolecular fibers occurs during the *in-situ* softening process. We then use those hydrogels for stem cell culture and the cellular response to light-switched mechanical cues are investigated, showing their differentiation pathways could be modulated by light. And light could also control cell spreading, migration, and releasement. Using photomasking, precise spatial distribution of cells is achieved. Our light-switchable peptide-based hydrogels, therefore, provide a benign platform for dynamic control of stem cell fate in a non-invasive way with light.

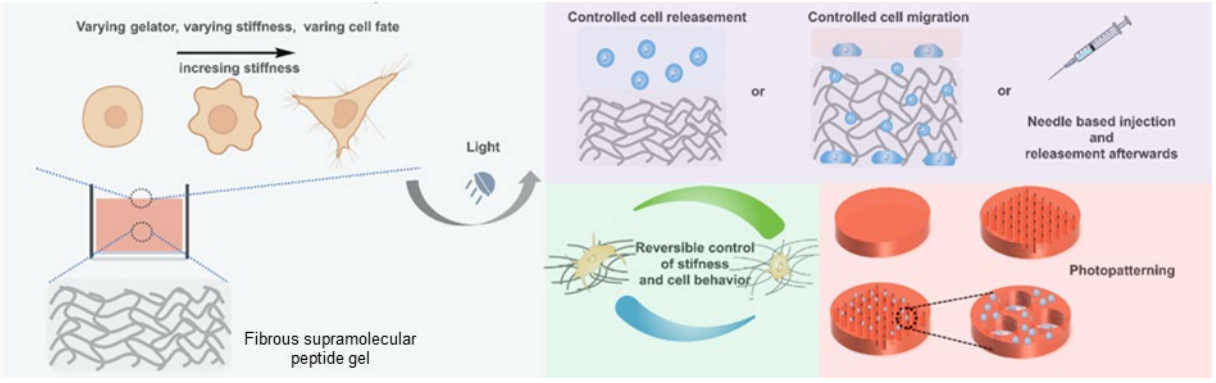

Figure 1: *Photoswitchable peptide hydrogel based versatile platform. It could be used for controlled stem cell differentiation, cell releasement, injection and photomasking.*

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[1]Bleger, D., Schwarz, J., Brouwer, A. M., Hecht, S., *J. Am. Chem. Soc.*, **2012**, 134, 20597-20600.
[2]Albert, L., Vazquez, O., *Chem .Commun.* **2019**, *55*, 10192-10213.