

A Facile Method to Increase Crosslinking Density and Degree of Chain Alignment in Hydrogels to Mimic Skeletal Muscle

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As a cause of efficient contraction and force transmission, structural characteristics of skeletal muscle tissue have taken spotlight in biomimetic and tissue engineering field. Because of many similarities, hydrogel is suitable for mimicking skeletal muscle tissue. However, mechanical weakness and isotropic structure of conventional hydrogel should be overcome for the application. Here, we suggest solvent exchange process as a remedy. Exchanging the external solvent of hydrogel to less polar solvent caused shrinking of hydrogel due to the highly hydrophilic polymer chain in hydrogel. By combining an additional unidirectional stretching and fixing process along with the solvent exchange, high degree of linear chain alignment and close-packing could be achieved. Closely packed chains allowed denser crosslinking which lead to mechanical reinforcement. The proposed process is fairly convenient and consistent strategy that brings about several differentiated advantages including desirable elongation kinetics and valuable molecular rearrangement of preformed hydrogel to mimic the structural and mechanical characteristics of skeletal muscle.