Thermoresponsive Protein-Engineered Fiber Based Hydrogels

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Hydrogels are networks of polymer chains that are highly absorbent and have multiple biomedical applications, including drug delivery, gene delivery and tissue engineering. While traditional hydrogels have been comprised of synthetic polymers, there has been a surge in protein-engineered hydrogels due to their inherent advantages in bioavailability, biocompatibility and biodegradability. We have developed a hydrogel based on a single coiled-coil protein Q, which is an engineered variant of the coiled-coil domain of cartilage oligomeric matrix protein (COMPcc). Q self-assembles to form nanofibers, which undergo physical entanglement to form hydrogels at low temperature, exhibiting an upper critical solution temperature (UCST) phase behavior. We will further discuss the effect of pH on fiber assembly and gelation properties. These hydrogels can potentially be used in drug delivery applications.