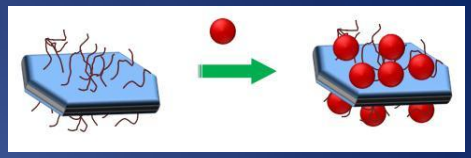
Polymer single crystals for nanocomposite hydrogel



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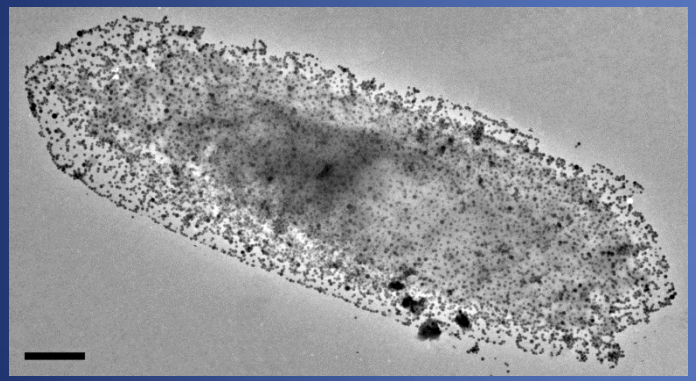
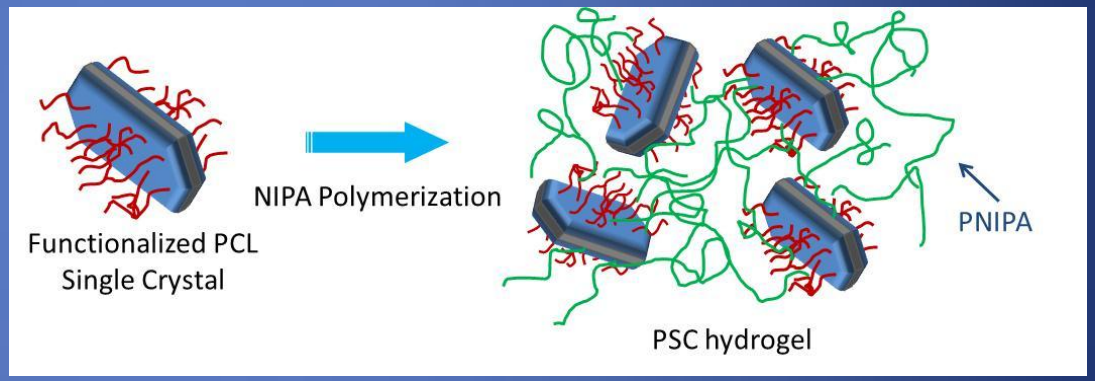
Hydrogels are polymer networks swollen with a large amount of water. From structure standpoint, they are remarkably similar to many load-bearing soft tissues in human body. However, one intrinsic drawback for conventional hydrogel is that they are mechanically weak. In this project, we aim to demonstrate that polymer single crystals (PSCs) can be used as unique nanofillers/crosslinkers to form hydrogels with exceptional mechanical properties.





In the first year of the project, we have successfully synthesized end-functionalized polycaprolactone (PCL), fabricated PCL PSCs with functional surface, immobilized silica nanoparticles (SiNPs) on the single crystal surface, and synthesized target hydrogel. We envisage that percolated networks of PSCs can be readily formed in PSC hydrogel systems, leading to the superior mechanical properties of the later. We anticipate that the proposed research, if successful, will pave the way to the concept of using PSC as nanoscale materials for advanced hydrogel design and synthesis.

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