Homopolymer Self-Assembly of Poly(propylene sulfone) Hydrogels via Dynamic Noncovalent Sulfone–Sulfone Bonding

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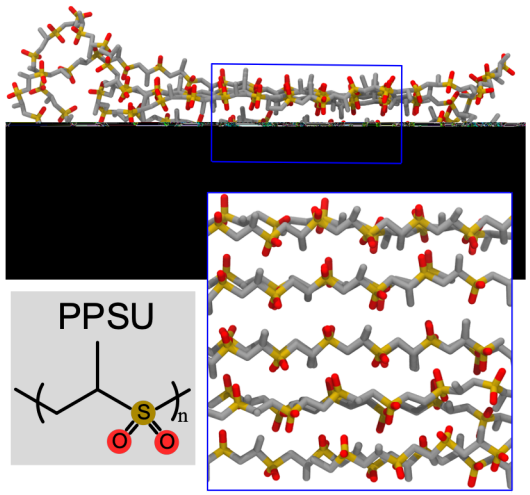
A new homopolymer which demonstrates exceptionally high drug encapsulation.

Self-assembly is ubiquitous in biological systems and underlies the formation of complex structures from simple components, which typically require amphiphilicity.

In collaboration with Prof. Scott group, we designed a new polymer PPSU. PPSU *homopolymer* assembles into crystalline frameworks or uniform nanostructured hydrogels of varying morphologies by tuning the hydration history (the stepwise increase in the water ratio within a lower-polarity water-miscible solvent DMSO). All-atom simulations supported the intermolecular sulfone-sulfone bonding in driving the PPSU assembly. Coarse-grained simulations demonstrated the formation of network-like morphologies.



PPSU homopolymer assembly via surfone-surfone bonding in water

The PPSU aggregates achieve *>95%* encapsulation efficiency for *hydrophilic* small molecules and biologics that are often difficult to load. It thus provides a versatile platform for supermolecular chemistry for applications of molecular encapsulation and separation.

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