Polymer Program

INSTITUTE OF MATERIALS SCIENCE

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Application of Polymer Sciences to Engineer Novel Biomaterials made from Recombinant Fusion Proteins

Abstract: The formation of unique self-assembled structures made of polymeric biomolecules, such as proteins and polysaccharides, is one of the essential characteristics of living organisms, which enables complex functions such as growth, maintenance, and responsiveness. Inspired by nature, my research group aims to develop new biomaterials consisting of proteins and/or polymers with highly organized structures and controlled properties. To achieve this goal, our lab leverages recombinant protein technology and synthetic biology to rationally design biomacromolecules and engineer their self-assembled structure to exhibit specific bioactivity from functionally folded, globular proteins. Currently, our group focuses on engineering Globular Protein Vesicles (GPVs), self-assembled from recombinant fusion proteins, to achieve a synthetic protocell model capable of sensing, stimuli-responsiveness, and furthermore, self-growth and division. In this talk, I will share our recent efforts to apply traditional polymer sciences, such as molecular packing parameter, characterization of polymersomes, and secondary intermolecular interactions in polymer solution/blends, for tuning the size, membrane structure, and permeability of the GPVs. Ultimately, the GPV-based synthetic cell platforms can serve as autonomous cell-like particles, which will be useful for a wide range of applications from protein delivery systems to micro-bioreactors.