Self-Assembling Materials for Energy Storage and Transport

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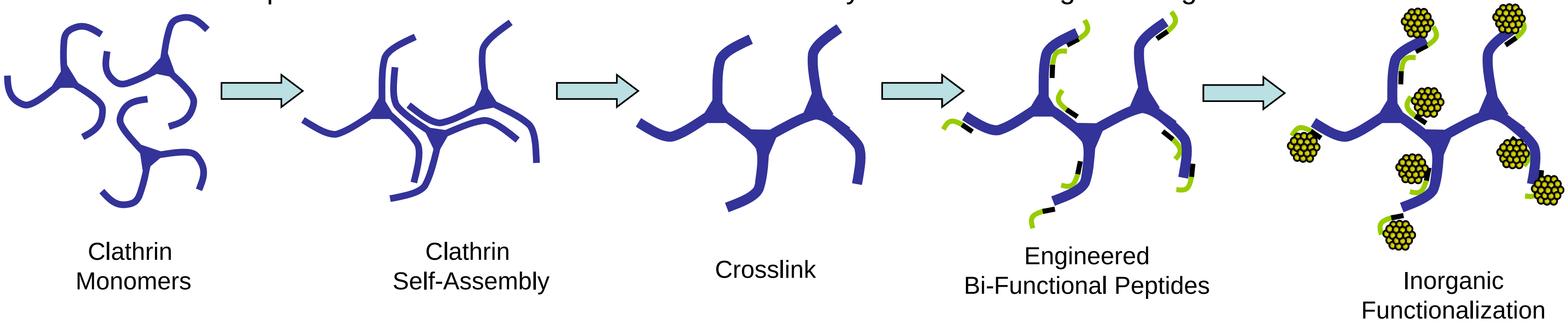
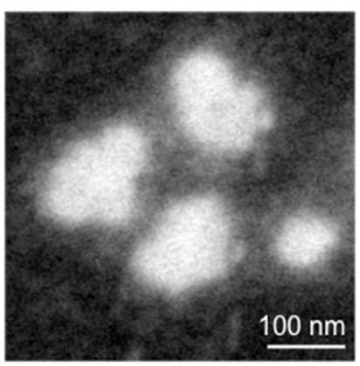
Nanoscale materials are generating revolutionary breakthroughs in energy storage and transport materials, though the optimum structure for maximum performance is unknown. We aimed to create a flexible platform to generate a variety of nanomaterials, which will enable access to new architectures and bio-inspired processing.

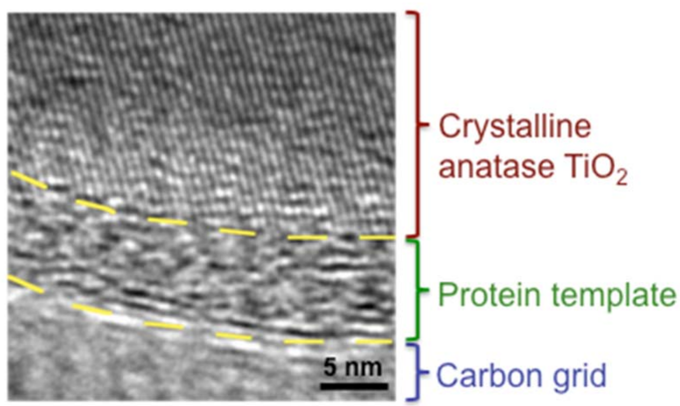
Molecular recognition & self-assembly: Natural systems use molecular recognition to enable the self-assembly of biomolecules into specific functional units. Inspired by this strategy, we designed bi-functional peptides that recognize sites on the clathrin protein to form functional co-assemblies for synthesis of a range of inorganic materials.

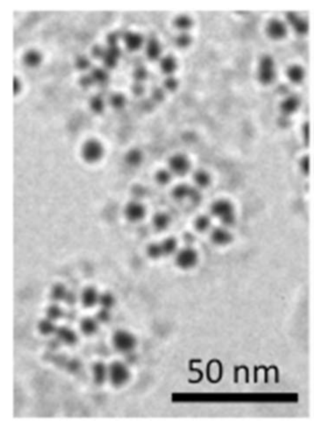


Flexible Biotemplating: Using bi-functional peptides, clathrin is functionalized for a variety of inorganic syntheses with no chemical or genetic modification required. We have demonstrated three bio-enabled synthesis reactions using this modular assembly strategy: anatase titanium dioxide, gold, and cobalt oxide. Each material is of interest for energy storage and transport applications.



Cobalt oxide nanoparticles





Gold nanoparticles templated inside clathrin assemblies