

Diseased Protein Aggregates as Functional Materials

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Through this presentation, I will show the recent efforts from our group which revealed advanced functional roles of materials derived from short peptides of a diseased state. Briefly, we utilize the self-assembling capabilities of 17LVFF21 which is known to behave as the nucleating core of amyloid A β aggregation- a misfolded protein best recognized in Alzheimer's disease.^{1,2} These sequences were covalently tweaked to create a novel class of functional cross β soft nanomaterials. Two prime applications were targeted. Firstly, the soft nanostructures were used as hosts for enzymes like cytochrome C to develop unique enzyme based nano hybrids which showed striking activation up to 450 fold in organic solvents compared to native activity.³ The sequences were altered to modulate the activity of the biocatalysts. Secondly, we used these nanostructures to exfoliate 2 dimensional (2D) layered materials like MoS₂. Incorporation of MoS₂ resulted in the creation of acutely sensitive near infra-red (NIR) light responsive materials.⁴ Finally, specifically designed amyloid forming peptides were synthesized and MoS₂ were imbibed to create NIR responsive hydrogels. Initial results have shown NIR triggered release of curcumin from the MoS₂ imbibed hydrogels.⁵

References:

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