Construction of Insulin 18-mer Nanoassemblies Driven by Coordination to Iron(II) and Zinc(II) Ions at Distinct Sites - DTU Orbit (08/11/2017)

Construction of Insulin 18-mer Nanoassemblies Driven by Coordination to Iron(II) and Zinc(II) Ions at Distinct Sites

Controlled self-assembly (SA) of proteins offers the possibility to tune their properties or to create new materials. Herein, we present the synthesis of a modified human insulin (HI) with two distinct metal-ion binding sites, one native, the other abiotic, enabling hierarchical SA through coordination with two different metal ions. Selective attachment of an abiotic 2,2′-bipyridine (bipy) ligand to HI, yielding HI–bipy, enabled Zn^{II}-binding hexamers to SA into trimers of hexamers, $[[HI–bipy]_6]_3$, driven by octahedral coordination to a Fe^{II} ion. The structures were studied in solution by small-angle X-ray scattering and on surfaces with AFM. The abiotic metal ligand had a higher affinity for Fe^{II} than Zn^{II} ions, enabling control of the hexamer formation with Zn^{II} and the formation of trimers of hexamers with FeII ions. This precise control of protein SA to give oligomers of oligomers provides nanoscale structures with potential applications in nanomedicine.

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