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Nano/biomaterial engineering through molecular reassembly on proteinticle scaffold

Proteinticles are nanoscale three-dimensional (3D) particles that are synthesized through self-assembly of multiple subunit proteins inside cells. Each proteinticle has a specific biological function and conformation (size, shape, symmetry pattern and surface topology); including viral capsids 1-5 and various cellular 3D structures 5-10 such as proteasome, ferritin, chaperonins, etc. A notable advantage of proteinticles is that a variety of heterologous proteins/peptides (e.g. bioprobes to capture disease specific biomarkers 1, 5-7, cancer cell targeting ligands 2,3,8,9, fluorescent proteins 4, recombinant peptides for on-site synthesis or conjugation of various nanomaterials 2, 3, etc.) can be genetically presented on the proteinticle surface with preserving their native function and structure through site-specific modification of subunit proteins. This suggests that proteinticles can be used as structurally versatile scaffolds for nano/biofunctional integration. This lecture introduce several important examples of functionally integrated nano/biomaterials that were developed through well designed molecular reassembly on the surface of proteinticle scaffolds: 3D bioprobes for accurate and rapid in vitro diagnosis, clinically feasible multimodalitysss agent for cancer theragnosis and industrially promising enzyme nanoparticles comprising genetically reassembled catalytic units. This novel approach of material engineering based on molecular reassembly using proteinticle scaffolds may provide a general platform for the facile production of a broad range of utility nano/biomaterials.

Biography

Jeewon Lee has pursued his Ph.D in Biochemical Engineering from Illinois Institute of Technology, USA. He is currently working as a Professor in Department of Chemical and Biochemical Engineering from Korea University. His Research areas and interest are from the fields of Protein Nanotechnology, Nanomedicine, Recombinant gene Expression, Protein Engineering and Microbial Proteomics.

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