

Keynote: Butterfly Wing-Inspired Nanoparticle Coatings

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Coatings are important to our daily life as they prevent fouling, provide protection and aesthetic effects, and guide the light transmission, reflection and scattering. The butterfly wings display a dazzling array of colors, from jet black to bright white with different hues, and some can be as transparent as glass. Yet, the wings are dry and clean. Inspired by butterfly wings, we create nanoparticle-based coatings by varying nanoparticle architectures (e.g. spherical, chain-like, and core-shell), assembly methods (e.g. dip coating, spray coating, and Pickering emulsion), and surface chemistry to achieve superhydrophobicity, superamphiphobicity, superhydrophilicity / underwater superoleophobicity. By controlling the size of the nanoparticles and morphology of their assemblies, we can make the coatings transparent[1] and uniformly colored [2, 3]. By embedding the particle coatings in a polymer matrix, we further demonstrate optimal light forward scattering for solar concentration (inspired by giant clams)[4] and smart windows that can change transparency (inspired by cephalopod skins)[5].

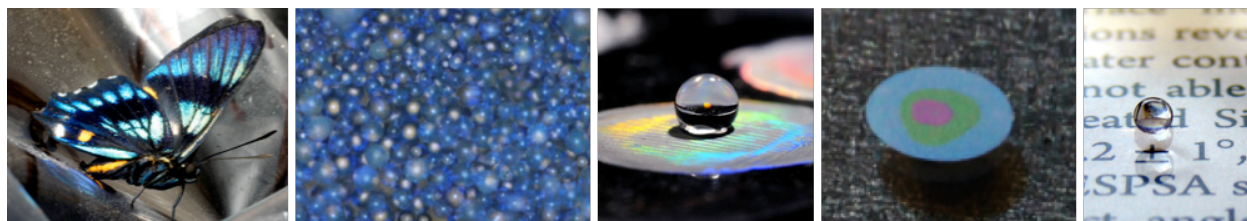


Fig. 1: (From Left to Right) Wing of butterfly (*Prepona philatelica*, Photo from Daniel Janzen), photonic balls, superhydrophobic iridescent coating, 3D printed colors from core-shell nanoparticles, and superhydrophobic transparent coating.

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