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BIOMIMETIC SOLUTION-BASED COATINGS FOR FUNCTIONAL APPLICATIONS

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Oral presentation

Poster presentation

ABSTRACT

Nature is a great source of inspiration for scientists and engineers to design and fabricate functional devices. Many animals and plants present a structural coloration, which is caused by the interaction of light with periodic structure, usually used in camouflage or to transmit information. Several natural surfaces show superwettability properties that allow self-cleaning abilities and water harvesting.

Here, we show two examples of biomimetic coatings inspired by the cuticle of the *Hoplia cerulea* beetle and *Stenocara* beetle. The coatings were fabricated by using a simple and scalable approach based on layer-by-layer deposition of sol-gel solutions by spin coating.

We developed a multilayer film with structural color by alternating a low refractive index material (silk fibroin) with a high refractive index layer (titania nanosheets). As the beetle *Hoplia coerulea* is able to modify its color in the presence of moisture, thanks to the variation of the thin films stack responsible for the interference color, in the same way, our structure can sense the environmental humidity with a reversible mechanism and transduces the change in a colorimetric scale [1].

Inspired to the back of Namib desert beetle, we fabricated micropatterned surfaces through a controlled dewetting of bilayer films. By changing the chemistry of the silica sol-gel, we realized patterns with chemical and topological contrast, consisting of hydrophilic islands on a hydrophobic layer. These surfaces are amenable to application in atmospheric water capture, as they facilitate condensation from humid air [2].

[1] E. Colusso et al., *J. Mater. Chem. C*, 5 (2017), 3924-3931

[2] E. Colusso et al., *Adv. Mater. Inter.*, 6 (2019), 1801629