Ultraviolet light exposure enhances the protective ability of synthetic melanin

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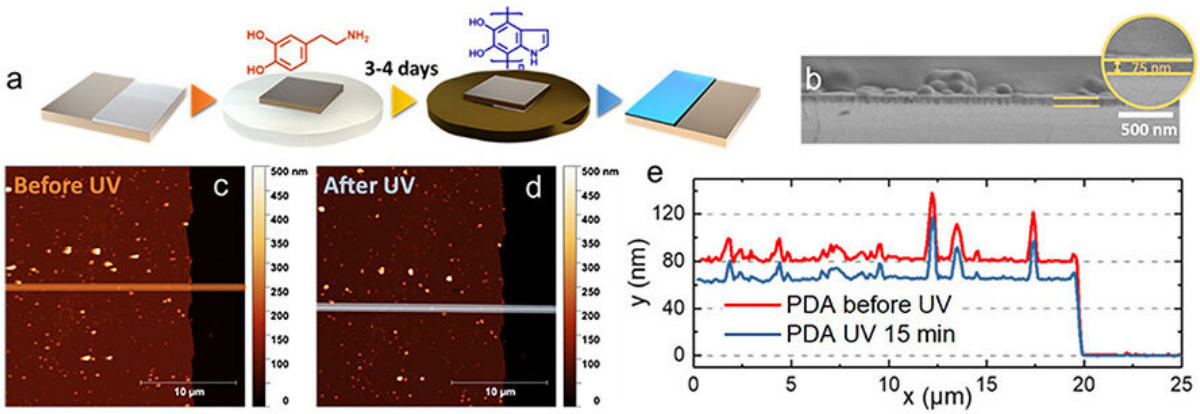

Credit: University of Akron

Melanin's high refractive index (RI) and broadband absorption capability contribute to the pigment's ability to protect against ultraviolet radiation (UV). These optical properties also contribute to the vibrant structural colors seen in birds and many other animals and plants.

Researchers believe UV light exposure influences the RI and absorption, as melanin undergoes chemical structural changes when exposed to UV light, but it remains unclear exactly what types of changes take place.

To provide insights, Li et al. measured the RI and changes in absorption

of synthetic melanin thin films exposed to a broad spectral range, from UV to near-infrared waves (360–1700 nanometers). They found both the RI and absorption coefficient significantly increased after UV exposure, especially near 400 nanometers. The findings suggest the protective function of melanin is enhanced after intense UV exposure.

To generalize their study against the large family of melanin pigments, the researchers used two types of synthetic melanin: polydopamine and a more natural version called poly(dopamine–L-DOPA).

"Although the L-DOPA-based films had slightly higher reflective indices after UV light exposure, the consistency of the RI and absorption coefficient changes observed after exposure in both films was the most prominent finding, and we observed these changes through accurate measurements of refractive indices for the first time," said author Dr. Ali Dhinojwala, interim director of The University of Akron's School of Polymer Science and Polymer Engineering and H.A. Morton Professor of polymer science.

Applications of the research include a better understanding of the photoprotective behavior of natural melanin and the structural colors in animals and plants, as well as the possibility of designing synthetic melanin materials for advanced UV protection. The researchers plan to investigate other melanin chemistries in the same way.

More information: Weiyao Li et al. Characterization of broadband complex refractive index of synthetic melanin coatings and their changes after ultraviolet irradiation, *Applied Physics Letters* (2020). DOI: 10.1063/5.0024229

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