'Flapping wings' powered by the Sun

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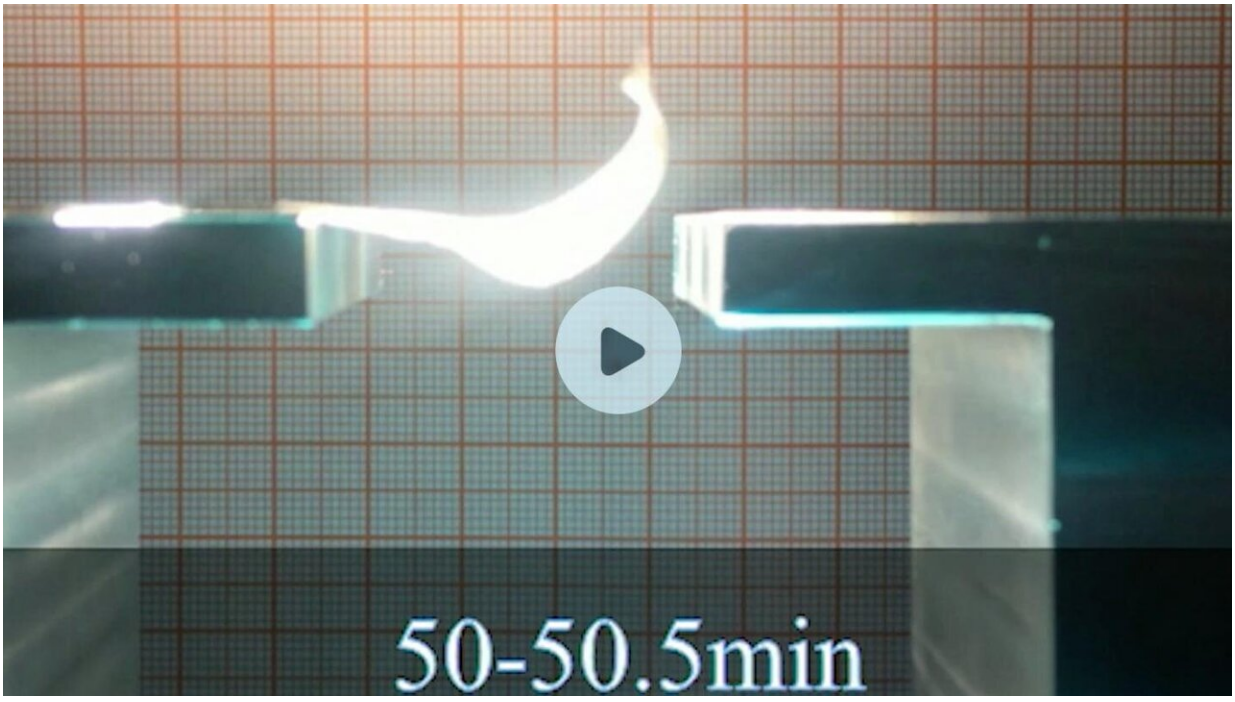

This tiny wing could someday be used in robots or devices to harvest solar energy. Credit: American Chemical Society

In ancient Greek mythology, Icarus' wax wings melted when he dared to fly too close to the sun. Now, researchers reporting in *ACS Applied Materials & Interfaces* have made artificial wings that are actually powered by the sun. The tiny wings, which can flap even faster than those of butterflies, could someday be used in robots or devices for solar energy harvesting, the researchers say. Watch a video of the flapping

wings in action here.

Light-driven actuators—devices that convert light directly into mechanical work—have attracted attention because they are wireless and easy to control. However, to keep going, they usually require a high-intensity light source that can be turned on and off, or additional hardware. Ningyi Yuan, Jianning Ding and colleagues wanted to develop a flexible film that could convert natural sunlight into a flapping motion, without the need for additional hardware.

To make their device, which they called a flexible bio-butterfly-wing (FBBW), the researchers coated a thin polymer sheet with a nanocrystalline metallic film. When the team fixed one end of the FBBW strip to a support and shone simulated sunlight onto it, the temperature of the strip increased, and the free end curled up because of the large difference in thermal expansion between the metal and polymer layers.

Then, the curved part of the FBBW shaded the metallic layer below, causing the temperature to drop and the strip to unfold. Continuous cycles of bending and unfolding produced a flapping motion that could exceed the frequency of actual butterfly wings. The team demonstrated the FBBW in a light-driven whirligig and sailboat, and in a device that converted sunlight into an electric current. It could someday be used in flying animal robots, among other applications, the researchers say.

More information: Xu Dong et al. Sunlight-Driven Continuous Flapping-Wing Motion, *ACS Applied Materials & Interfaces* (2020). DOI: 10.1021/acsami.9b20250

Provided by American Chemical Society

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