Chemists pioneer responsive polymers that heat up when exposed to LED light

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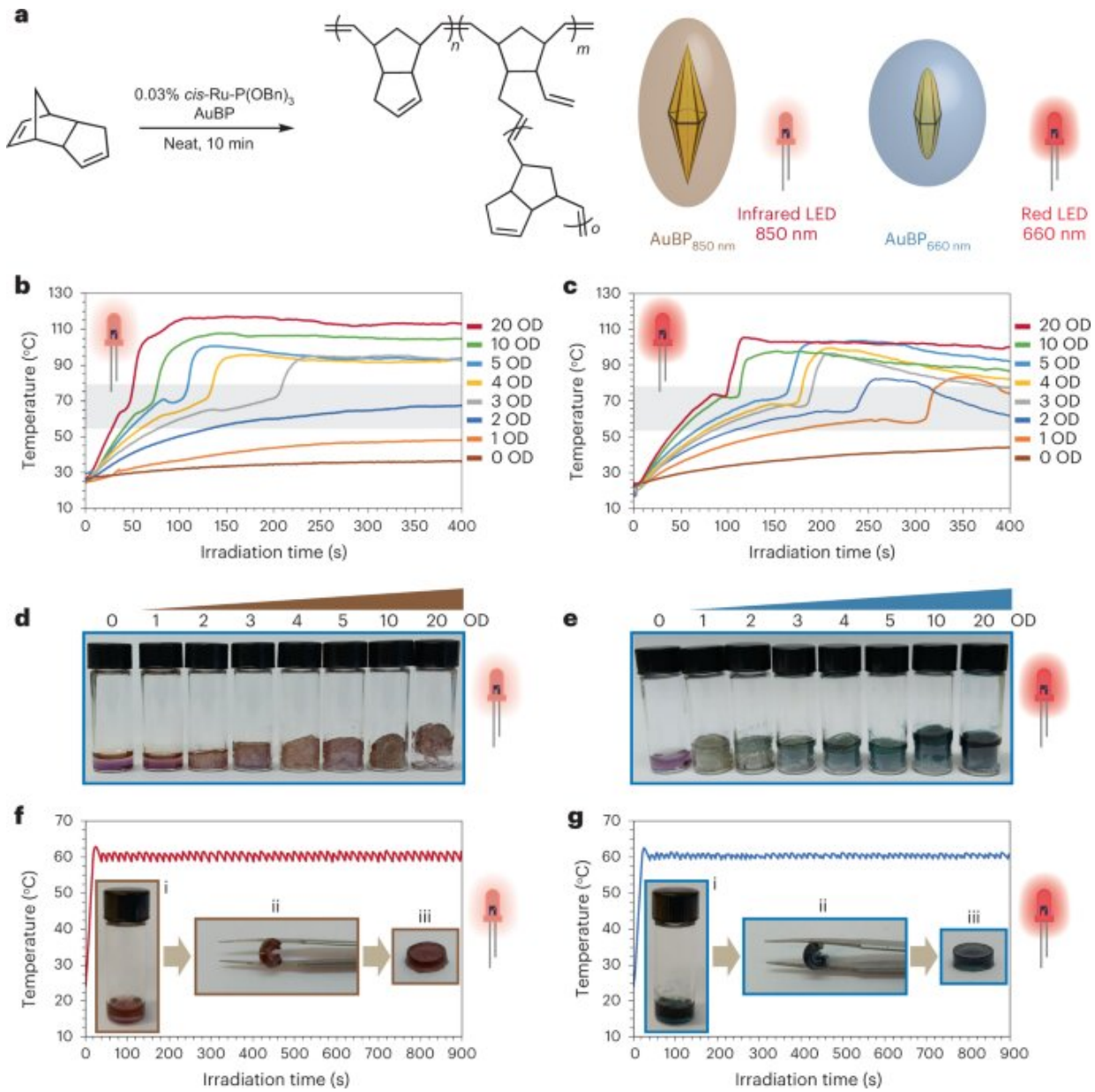

Plasmon-induced DCPD polymerization. Credit: *Nature Chemistry* (2023). DOI: 10.1038/s41557-022-01124-7

Creating new materials and speeding up reactions is what they do. Sounds a bit mundane, no? It is anything but. Materials that catalyze faster can be used in a wide range of fields from pharmaceuticals to future Mars habitats.

Now, Ben-Gurion University of the Negev chemists have come together to combine their expertise and produce new responsive polymers.

Their findings were just published in *Nature Chemistry*.

Prof. Yossi Weizmann makes gold nanoparticles that convert light into heat. Prof. Gabi Lemcoff makes latent catalysts that need to be triggered. The two, as well as MSc student Nir Lemcoff, put their heads together and spent two years developing a new kind of polymer and a more efficient and environmentally friendly way to make chemical reactions happen.

"If you add my gold nanoparticles into the liquid solution with Prof. Lemcoff's latent catalysts, then the heat that they generate triggers the catalysts turning the liquid into a solid. That solid quickly heats up when exposed to LED light," explains Prof. Weizmann.

The solid polymer is flexible when made with UV light, but also hardens when exposed to IR light.

"We were surprised that the polymers responded to light," says Prof. Lemcoff.

"I conducted the same experiment 1,000 times by using a computerized protocol," says Nir Lemcoff, "I exposed the polymer to light and each time it heated up quickly to the same temperatures. It was extremely stable and did not degenerate over time."

While exciting in and of itself, this is only the beginning: Now that they understand how the reaction occurs, they can begin to design all sorts of new materials.

Prof. Lemcoff offered a half fanciful/half serious example.

"Let's say we build a Mars habitat. It's cold there, so it will need to be underground. But there's no electricity. So, you could build it with these polymers and then shine low energy light on them to heat them up," he said with his eyes alight.

More information: Nir Lemcoff et al, Plasmonic visible–near infrared photothermal activation of olefin metathesis enabling photoresponsive materials, *Nature Chemistry* (2023). DOI: 10.1038/s41557-022-01124-7

Provided by Ben-Gurion University of the Negev