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New polymers change color when stressed

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Champaign-- U.S. scientists say they are developing polymers that, when overstressed, change color -- making them ideal for [applications](#) such as bridge coatings.

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The force-sensitive polymers being developed at the University of Illinois contain mechanically active molecules called mechanophores. When pushed or pulled with a certain force, specific chemical reactions are triggered.

"This offers a new way to build function directly into synthetic materials," said Professor Nancy Sottos, who leads the research. "And it opens the door to creating mechanophores that can perform different responsive functions, including self-sensing and self-reinforcing, when stressed."

Sottos and her colleagues previously showed mechanical force could induce a reaction in mechanophore-linked polymers that were in solution. Now the researchers show they can perform a similar feat in a solid polymer.

Sottos said that in critical material [systems](#), such as polymers used in aircraft components, self-sensing and self-reinforcing capabilities could be used to report damage and warn of potential component failure or even repair damage in early stages to avoid catastrophic failure.

"By coupling mechanical energy directly to structural response, the desired functionality could be precisely linked to the triggering stimulus," Sottos said.

The study that included research assistant Douglas Davis, along with Professors Paul Braun, Todd Martinez, Jeffrey Moore and Scott White, is reported in the journal Nature.

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