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Chemical ‘Nanofuse’

A conducting molecule that switches off when jolted with electricity functions as a molecular fuse

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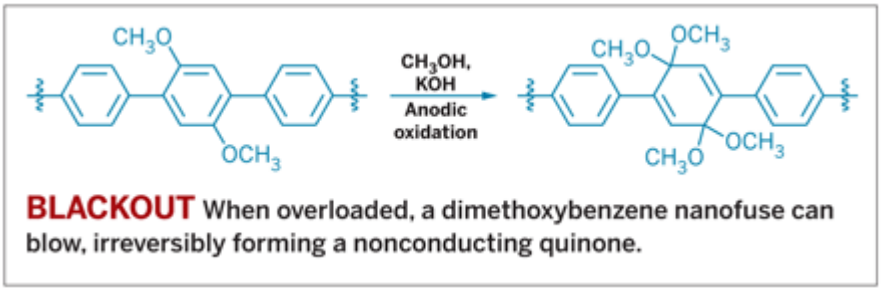

BLACKOUT When overloaded, a dimethoxybenzene nanofuse can blow, irreversibly forming a nonconducting quinone.

Chemists have created the first example of a rudimentary molecular “nanofuse,” a conducting molecule that switches to a nonconducting form when hit with a big enough jolt of electricity—like a blown electrical fuse (*Chem. Commun.*, DOI: 10.1039/c0cc04388e). Although researchers have designed many molecular systems that reversibly switch on and off, systems that irreversibly switch off haven’t been well explored. But nanofuses could play an important role in molecular electronics, protecting against voltage surges or serving as components in memory storage systems. Juan M. Cuerva of the University of Granada, in Spain, and colleagues prepared a series of *p*-dialkoxybenzene derivatives that conduct electricity when attached to electrodes. When the voltage applied to the molecular circuit is high enough, the molecule is irreversibly oxidized to a quinone-bisketal, which breaks the circuit and stops the electrical conduction. X-ray diffraction studies and computational modeling indicate the *p*-dialkoxybenzenes are linear, and that their oxidized, quinone-bisketal mates retain the same geometry. This property may be particularly important, the researchers write, “guaranteeing that there is not any mechanical stress in the global system when the switching process takes place.”

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