

Popular Mechanics BREAKTHROUGH AWARDS

We salute the innovators who are shaping the world's future through science and technology--and new products that represent benchmarks of engineering.

BY LOGAN WARD

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Photograph by Misha Gravenor

Toxic Avenger

FAST-ACT, a toxin-neutralizing nanopowder, offers a potent defense against chemical attack.

Innovator: Kenneth Klabunde

Think of it as a terrorism extinguisher. Discharged from a pressurized cylinder, a new powder known as FAST-ACT (First Applied Sorbent Treatment-Against Chemical Threats) neutralizes mustard gas, sarin and other chemical-warfare agents--as well as many industrial chemicals. The powder, developed by Kansas State University chemist Kenneth Klabunde (pictured), consists of nanostructured crystallites of magnesium oxide (MgO) and titanium oxide (TiO₂). Each grain's jagged edges multiply the powder's surface area and porosity, making it highly reactive. Common MgO powder has a surface area of 30 square meters per gram; with FAST-ACT's nanostructuring, that grows to 320 square meters. "Seventeen grams of the powder has the surface area of a football field," Klabunde says.

Sprayed at a chlorine gas leak, the powder knocks the vapor to earth, leaving a harmless solid to be swept up. When pitted against VX nerve gas in tests at the U. S. Soldier Biological Chemical Command, the nanopowder quickly prevailed, converting 99.9 percent of the killer gas into a less hazardous solid.

"Instead of a simple defensive technology like duct tape and plastic, this allows the user to be active in neutralizing a threat," says Stephen J. Lee, director of organic chemistry in the Chemical Sciences Division of the U.S. Army Research Office. "It is one of the first nanotechnology products to make it to the marketplace. Ultimately, it will save lives."

Deployment date: FAST-ACT is already for sale.