

Harnessing the energy of fireworks for fuel

The world relies heavily on gasoline and other hydrocarbons to power its cars and trucks. In search of an alternative fuel type, some researchers are turning to the stuff of fireworks and explosives: metal powders. And now one team is reporting a method to produce a metal nanopowder fuel with high energy content that is stable in air and doesn't go boom until ignited. Their study appears in the ACS journal *Energy & Fuels*.

Hydrocarbon fuels are liquid at room temperature, are simple to store, and their energy can be used easily in cars and trucks. Metal powders, which can contain large amounts of energy, have long been used as a fuel in explosives, propellants and pyrotechnics. It might seem counterintuitive to develop them as a fuel for vehicles, but some researchers have proposed to do just that. A major challenge is that high-energy **metal nanopowder** fuels tend to be unstable and ignite on contact with air. Albert Epshteyn and colleagues wanted to find a way to harness and control them, producing a fuel with both high energy content and good air stability.

The researchers developed a method using an ultrasound-mediated chemical process to combine the metals **titanium**, **aluminum** and **boron** with a sprinkle of hydrogen in a mixed-metal nanopowder fuel. The resulting material was both more stable and had a higher energy content than the standard nano-aluminum fuels. With an energy density of at least 89 kilojoules/milliliter, which is significantly superior to hydrocarbons' 33 kilojoules/milliliter, this new titanium-aluminum-boron nanopowder packs a big punch in a small package.

Source: American Chemical Society. www.acs.org