

Nanoparticles increase biofuel performance

April 8 2011

How to put more bang in your biofuels? Nanoparticles! A new study in the *Journal of Renewable and Sustainable Energy* shows that the addition of alumina nanoparticles can improve the performance and combustion of biodiesel, while producing fewer emissions.

Why add [nanoparticles](#)? The idea, says lead author R. B. Anand, an associate professor of mechanical engineering at the National Institute of Technology in Tiruchirappalli, India, is that because of their high surface-to-volume ratio, the nanoparticles—which, in the study, had an average diameter of 51 billionths of a meter—have more reactive surfaces, allowing them to act as more efficient chemical catalysts, thus increasing fuel [combustion](#). The presence of the particles also increases fuel–air mixing in the fuel, which leads to more complete burning.

In the study, Anand and co-author J. Sathik Basha first used a mechanical agitator to create an emulsion consisting of jatropha [biodiesel](#) (a fuel derived from the crushed seeds of the jatropha plant), water, and a surfactant, then blended in different proportions of alumina nanoparticles. In addition to outperforming regular biofuel, the nanoparticle-spiked fuels produced significantly lower quantities of nitrogen oxide and carbon monoxide gases, and created less smoke.

The researchers are now testing other types of nanoparticles, including hollow carbon nanotubes, and investigating the effects of nano-additives to engine lubrication and cooling systems. One obstacle to the application of this kind of nanotechnology is the high cost of nanoparticle production, says Anand—who also cautions that

nanoparticles "should be used judiciously," because they tend to "entrain into human bodies."

More information: The article, "Role of nano-additive blended biodiesel emulsion fuel on the working characteristics of a diesel engine," by R. B. Anand and J. Sadhik Basha, appears in the *Journal of Renewable and Sustainable Energy*. jrse.aip.org/

Provided by American Institute of Physics

Citation: Nanoparticles increase biofuel performance (2011, April 8) retrieved 19 April 2024 from <https://phys.org/news/2011-04-nanoparticles-biofuel.html>

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