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Fuel additives: Turbo graphene

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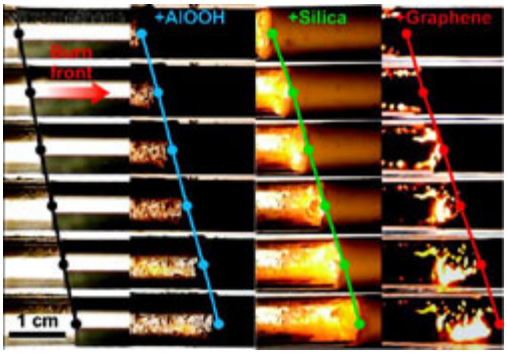
Colloidal particles made from functionalized graphene sheets can enhance fuel combustion.



Future high-speed propulsion systems will require environmentally friendly high-energy fuels. One emerging approach to this challenge is not to develop new fuels but to improve existing fuels by adding nanostructured particles. Now Richard Yetter, Ilhan Aksay and co-workers at the Pennsylvania State University and Princeton University[1] have shown that the combustion performance of nitromethane, a potential rocket propellant, can be greatly enhanced by adding functionalized graphene sheets to the fuel.

The researchers prepared nitromethane samples with added catalytic particles of aluminium oxyhydroxide, amorphous silicon oxide or graphene sheets bearing oxygen and hydrogen-based functional groups. All three additives improved performance, most notably the sample with functionalized graphene sheets, which ignited at a lower temperature and burned at a rate 175% higher than the untreated fuel.

The graphene sheets act as efficient catalysts because they are easily dispersed and form colloidal particles that have large surface areas in contact with the fuel. They may also enhance the heat transfer during combustion owing to their strong thermal and radiative conductivity. However, arguably the greatest advantage of functionalized graphene sheets over metal oxide catalysts is that they do not leave any solid reaction products — instead the sheets eventually take part in the reaction and are consumed along with the fuel.

Reference

1. Sabourin, J. L., Dabbs, D. M., Yetter, R. A., Dryer, F. L. & Aksay, I. A. Functionalized graphene sheet colloids for enhanced fuel/propellant combustion. *ACS Nano* doi:10.1021/nn901006w (2009). | **Article** | **OpenURL**