

# Meet the critical material that can also prevent fire...

Graphene has such a combination of world beating properties it is being used in new applications all the time. The latest of these applications is in fire prevention.

Graphene is made of carbon, so you would expect it to burn a bit like charcoal. In fact graphene seems so difficult to set alight it is being used to prevent fires spreading through combustible materials.

## Examples of graphene fire preventatives

In one experiment by an Australian company called first graphite, two pieces of wood were subjected to a blowtorch for twelve seconds and left to burn.



The flame penetrated both samples and set them alight. The untreated wood rapidly caught fire and burned to ash within seconds. The wood coated with graphene could not resist the intensity of the blowtorch which burned a hole right through. Once the blowtorch stopped the flames quickly went out and the glowing edges gradually faded. The treated wood sample survived.

This is not the only example of graphene being used as a fire retardant. A few weeks ago a new graphene flame retardant fabric was exhibited in Shanghai, China. A flame was played over the surface of the fabric without any apparent effect. You can see the demonstration at [this link](#)

## How fire works

To understand how fires spread you need to know about the fire triangle



Any fire needs oxygen, heat and fuel. Deny any one of these and the fire will go out or not start in the first place. All fire retardant coatings work by targeting one of these three key ingredients.

## How graphene works as a fire retardant

Graphene and graphene oxide nanoplatelets are available as powders and pastes that can be mixed with a variety of liquids and polymers. This flexibility makes them ideal additives and coatings for a wide range of products.

A team at Henan University in China has researched the way graphene works and discovered that there are a several ways graphene prevents fires spreading.

The Chinese team found that when a graphene coating is burned it chars. This char layer is dense and continuous. It blocks the surface and prevents oxygen accessing deeper into the material. Graphene has more tricks up its sleeve. It conducts heat really well. This means localised heat is conducted away into the rest of the material and dispersed, making it hard for the fire to spread. The heat conducting and char blocking create what the authors termed a labyrinth effect where the heat and combustion gases have to follow a tortuous path to the fuel and this effectively prevents the spread of the flames.

As well as the fire retardant effect graphene and graphene oxide also have a very high surface area. This adsorbs flammable organic volatiles and hinders their release and diffusion during combustion. It is likely that graphene

additives and coatings will reduce poisonous gases from a fire.

I feel in a privileged position at the moment, the pace of graphene research is breath-taking. There are so many uses for these new materials; saving lives is a particularly satisfying application for this technology.