Rice University graduate student Kevin Wyss holds a vial of graphene and samples of the graphene-reinforced polyurethane made by the Ford Motor Company | Photo source Jeff Fitlow/Rice University

TURNING PLASTIC FROM OLD VEHICLES INTO GRAPHENE

MOBILITY & TRANSPORT

A new process could be used to create new and better car parts from plastics found in end-of-life vehicles

Spotted: Graphene has long been considered something of a wonder material. Made of a single layer of carbon atoms arranged in a honeycomb-like lattice structure, the material has been used for a range of applications such as paints, sensors, electronics, and solar panels. Now, a partnership between Rice University researchers and the Ford Motor Company, has added car parts to the growing list of graphene’s uses. And the real kicker? The graphene for the parts can be made from difficult-to-recycle plastics found in old vehicles.

Mixed plastic is a headache for the auto-industry as cars contain a complex combination of plastic resin, filler, and reinforcements that must be separated before they can be recycled – a process that is difficult if not impossible.

For the Rice-Ford research team, a process called Flash Joule Heating is the solution to this problem. In this process, mixed plastic is packed between electrodes alongside a coke additive. The electrodes then blast the plastic with a high-voltage current that vapourises other elements in the plastic leaving behind graphene. The graphene can then be used to reinforce new car parts. And the researchers have put the process to the test using plastic from the bumpers, gaskets, carpets, mats, seating, and door casings of old Ford pickup trucks.

Flash Joule heating does not require solvents and uses minimal energy. Crucially, it also doesn’t require the plastic feedstock to be pre-sorted. The Rice University research project included a full life-cycle analysis of graphene from ‘flashed’ car parts compared to that produced by other

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methods. The results showed that using graphene from Flash Joule heating substantially reduced energy and water consumption, as well as greenhouse gas emissions.

Ford has been using the graphene to reinforce a polyurethane foam found in its vehicles with promising results. “When we got the graphene back from Rice, we incorporated it into our foam in very small quantities and saw significant improvement,” explains Alper Kiziltas, a technical expert at Ford research. “It exceeded our expectations in providing both excellent mechanical and physical properties for our applications,” he added.

Springwise has previously spotted Flash Joule heating being used to extract metals from electronic waste. Elsewhere Springwise has spotted graphene being used to create ‘power suits’ for electric vehicles, and a pollution-absorbing coating for pavements.

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**Takeaway:**

Recycling is becoming an increasingly pressing issue for carmakers. In Europe, for example, manufacturers are only allowed to landfill 5 per cent of the materials from an old vehicle. But much of the mixed plastic ends up being incinerated. And given that 6.1 million passenger cars, vans and other light goods vehicles were scrapped in the EU alone in 2019, what we do with vehicles at the end of their life has a significant impact. The ability to convert mixed plastic into useful graphene is therefore an important development.