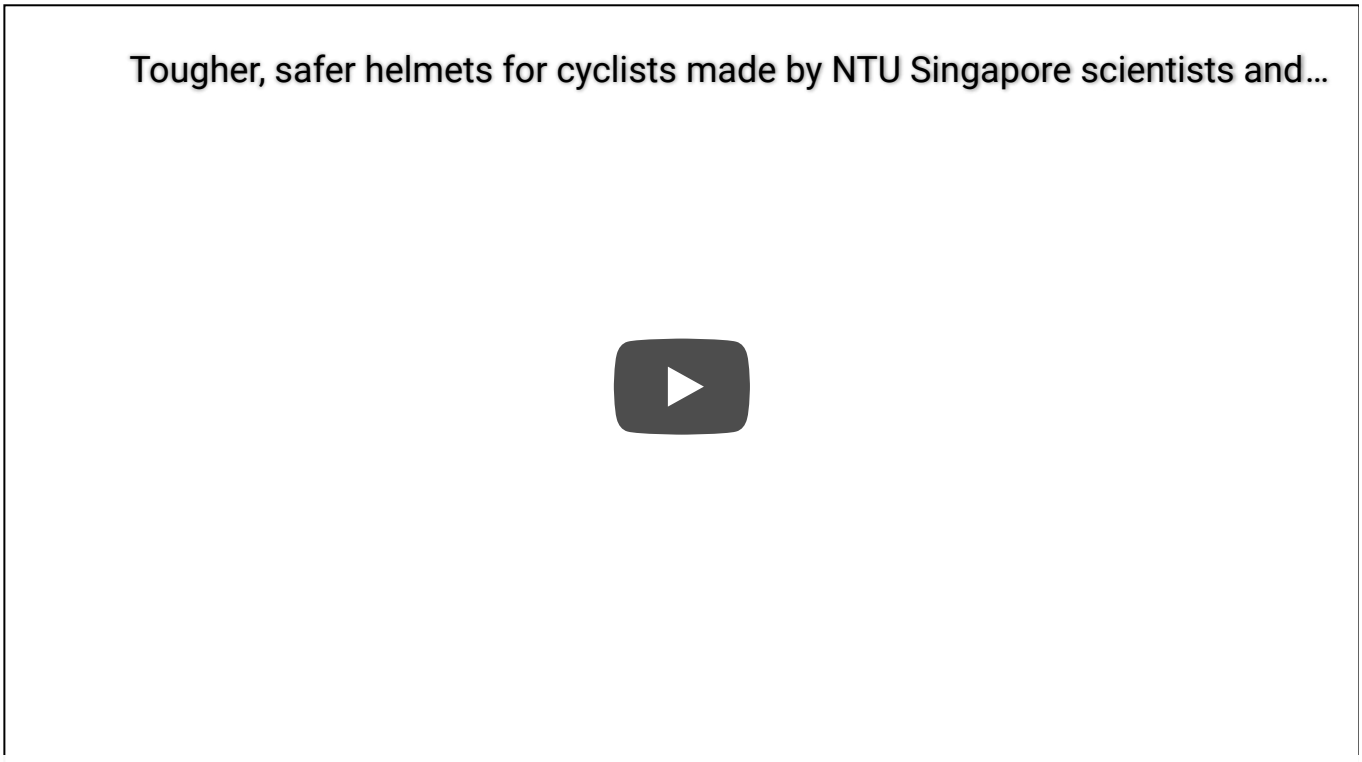
AUTOS

Prototype helmet improves safety for cyclists

July 22, 2021 Autos

posted on Jul. 22, 2021 at 9:50 am

Researchers have developed a more protective bicycle helmet with an outer shell made from Elium, an energy absorbing thermoplastic resin reinforced with carbon fibre.



Developed by a team from NTU Singapore and partners Arkema, the helmet prototype is claimed to reduce the amount of energy transferred

develop a moulding process for the material.

MORE FROM MATERIALS

"Our partnership with Arkema is driven by the desire to develop a new type of helmet that is stronger and safer for cyclists," said researcher leader Associate Professor Leong Kah Fai from the School of Mechanical and Aerospace Engineering. "Helmets have been proven time and time again to play a critical role in reducing the severity of injuries and number of fatalities. Our prototype helmet has been subjected to a barrage of internationally benchmarked tests and has demonstrated the ability to provide greater protection for cyclists compared to conventional helmets."

The findings by the research team have been published in *Composites Part B: Engineering*.

The outer shell of a bicycle helmet is usually made from a mass-produced plastic like polycarbonate and beneath it is a layer of expanded polystyrene foam. The outer shell is designed to crack on impact to dissipate energy across the entire surface of the helmet. The foam layer then compresses and absorbs the bulk of impact energy so that less energy is transferred to the head.

The team's composite helmet replaces the conventional polycarbonate outer shell with one using Elium reinforced with carbon fibre.

This reinforcement is claimed to make the outer shell tougher, stiffer, and less brittle than a polycarbonate shell. It also increases the helmet's contact time, which is the total time of impact in which the helmet experiences impact load.

"When the helmet hits a surface at high speed, we noticed that there is a deformation along with the spread failure of the composite shell, which means [illegible]," Dr Somen said in a statement. "This is what you really want – the more

much less energy at about 35 per cent.

As well as being safer, the prototype helmet is said to be easier to produce. Elium is liquid at ambient temperature, allowing it to be moulded at room temperature as opposed to other thermoplastic-based composite shells that require higher temperature processing.

The NTU researchers are working with Arkema to commercialise the helmet's manufacturing process, which would allow interested manufacturers to produce them. Assoc Prof Leong said that helmets produced through their method would offer the same protection of current top-tier helmets, but potentially at the price of mid-tier helmets ($100-$150).