

# Lightweight composites to get trimmer and smarter

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New generation polymer composite materials are ideal for use in the transport industry.

(PhysOrg.com) -- CSIRO researchers have set themselves the goal of producing a new generation of super-strong, lightweight polymer composite materials for use in aircraft, road vehicles, trains and ferries.

Aerospace manufacturers have already embraced weight-reducing composites, but until recently they were used in only a limited range of applications. However, in the new generation of aircraft being developed and built today, polymer composites are used extensively, for fuselage and other components, saving fuel and cutting emissions.

A team led by Dr Stuart Bateman at CSIRO [Materials](#) Science and Engineering is designing and testing even lighter and stronger polymer composites that will out-perform the conventional materials currently

used in the transportation sector.

"Composites with improved mechanical properties allow greater design flexibility, and the down-gauging of wall thickness for additional weight savings," Dr Bateman said. "We use nano-technologies to improve the mechanical performance of conventional composite materials, and at the same time introduce valuable functional properties previously not possible in composites."

Composite materials with new functional properties are created by dispersing low concentrations of specially chosen additives within the polymer matrix. By this means the CSIRO team is producing polymers with unprecedented properties, such as strength, stiffness, impact resistance, fire resistance, and heat reflectance.

Dr Bateman said one of the team's key competencies is designing and dispersing functional additives on a [nanometer scale](#) using conventional polymer composite processing equipment.

"The design of the additive and controlling its dispersion are both crucial to producing the mix of properties required. We will continue to partner with manufacturers who can exploit our research capabilities for producing their own unique applications," he said.

Some of the new functional additives are effective at trace concentrations, below one per cent. This low content is a bonus because it avoids unwanted changes in the material's processing ability and end properties such as surface finish, while still improving mechanical properties.

A good example of this is a new generation of nano-scale flame retardants that CSIRO is testing. These are proving superior to the existing flame retardant technology, which is based on the use of

halogenated compounds in concentrations that often reduce mechanical performance.

Many traditional halogenated compounds are falling out of favour with health and environmental agencies, creating a pressing need for alternatives. Super-light composites with enhanced flame retardant properties are expected to find uses in transportation, infrastructure and in defence applications.

Provided by CSIRO ([news](#) : [web](#))

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