

# Recycled textile fibre as reinforcement for polymer composites

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About 1,000,000 tons of textile fibre wastes are generated each year in Australia, of which about 900,000 tons goes to landfill. As about 35-40% of textile fibres are cotton, the cotton pipeline has a significant environmental responsibility to fulfil.

Recycling of textile waste gives fibre a second life in a rejuvenated life cycle and thus increases the total value of the fibre. Much recycled fibre ends up in low-value products. The development of new, higher value products from recycled fibres will encourage utilisation of the fibres and contribute to the future sustainability of the cotton industry.

CSIRO has converted recycled cotton fibres into thermosett and thermoplastic polymeric composites and evaluated their mechanical performance. The composites reinforced by the recycled fibres show similar mechanical properties as those reinforced by virgin plant fibres such as hemp, flax and jute that are traditionally used in composites. These composites are being used increasingly in automotive parts, furniture, building and packaging materials.

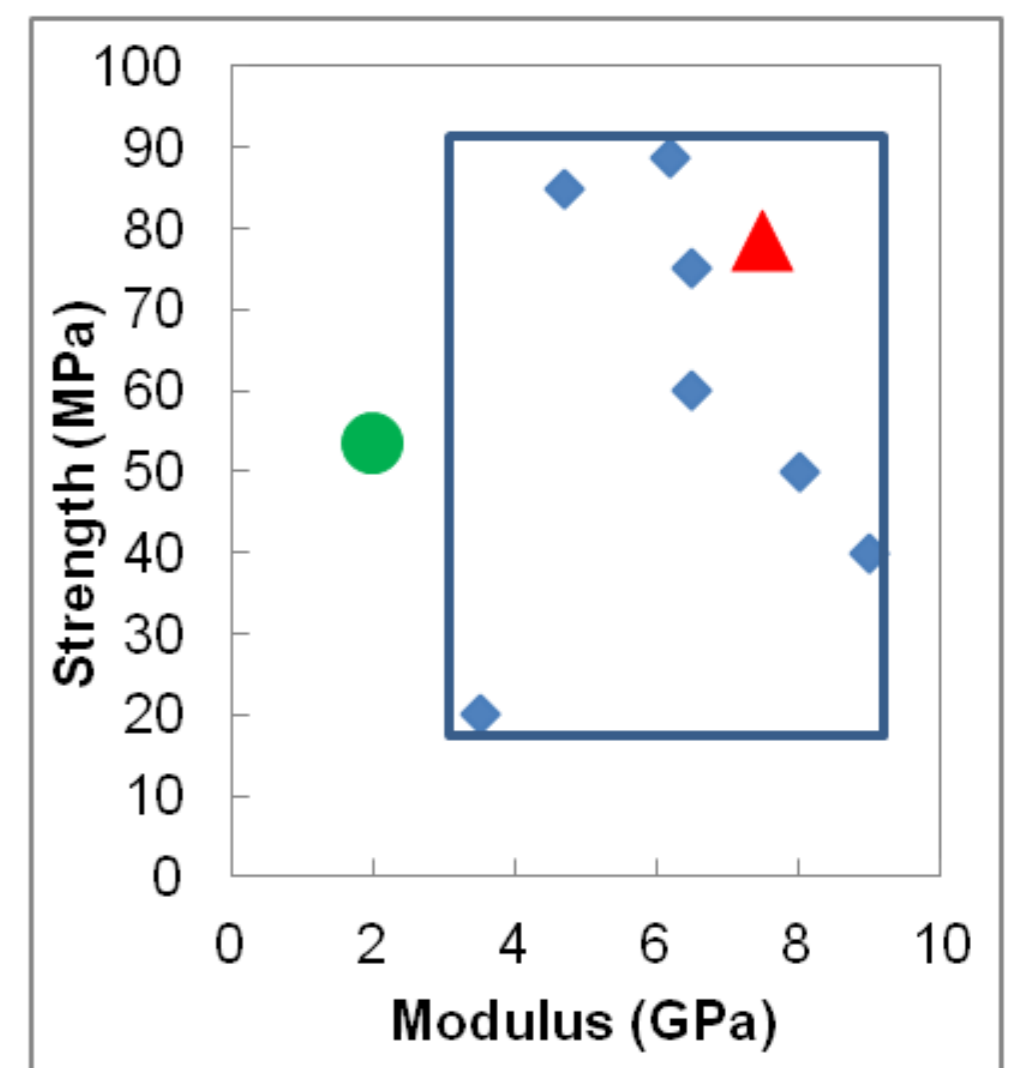
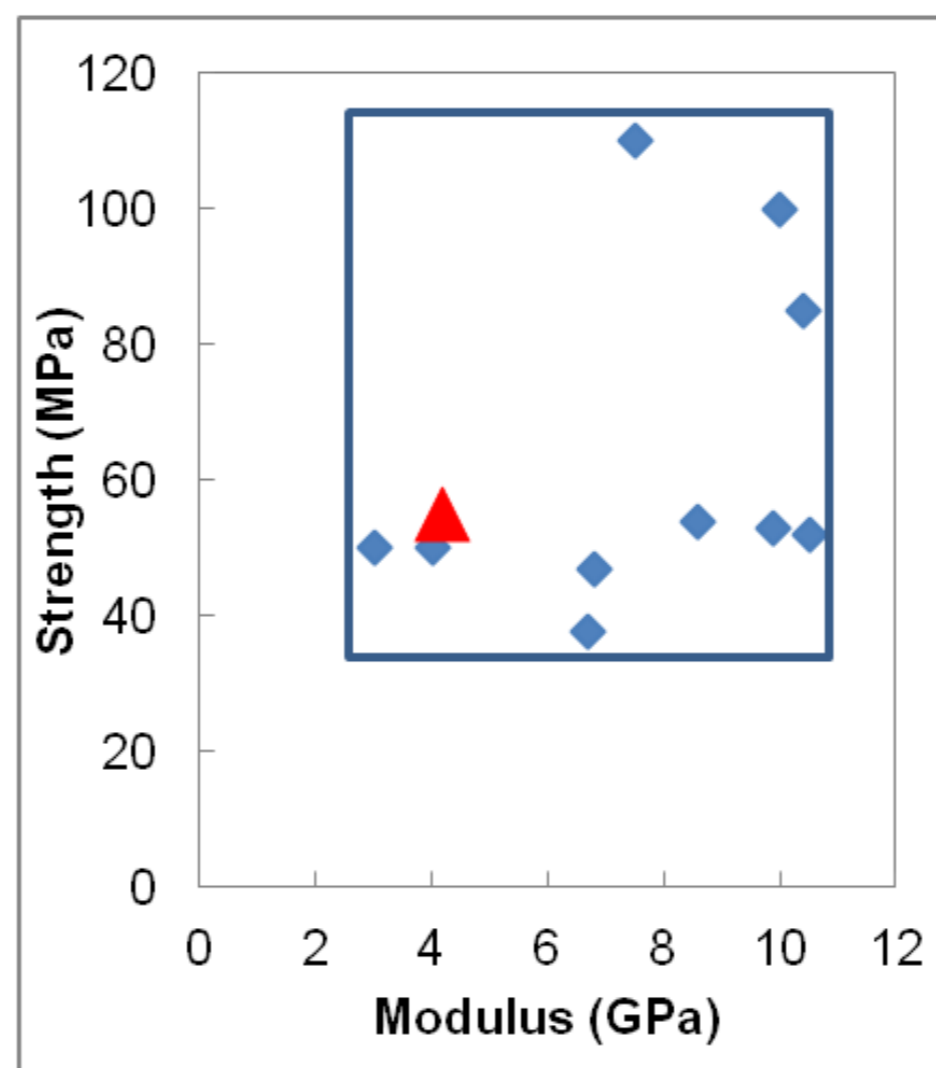
There is good opportunity to utilise low value virgin and waste cotton fibre, cotton stem fibres and even gin trash as the fibre reinforcement in composites for a range of applications.

## Mechanical properties of cotton and fibres used in engineering composites

Fibre	Density	Elongation	Tensile strength		Modulus	
	g/cm <sup>3</sup>	%	MPa	cN/tex	GPa	cN/tex
<b>Cotton</b>	<b>1.5</b>	<b>7</b>	<b>400</b>	<b>30-40</b>	<b>5.5-12.6</b>	<b>500-700</b>
Flax	1.5	3	669	46	20	1377
Hemp	1.4	2.2	645	44	17	1177
Jute	1.3	1.8	393-773	31	26.5	1720
Kenaf	1.3	1.6	430	33	26.9	2070
Polyester	1.4	37	660	47	12	880
E-glass	2.5	0.5	2000-3500	75	70	2940



Plant fibres are used to make parts in Mercedes-Benz E-Class and A-200 cars.



Strength of polyester thermoset composites (LHS) and polypropylene thermoplastic composites (RHS). ▲ Recycled fibre ◆ Virgin plant fibres (flax, hemp, jute) ● No fibre