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A new generation of lighter, stronger plastics could be on the way thanks to a new chemical process developed by scientists at the University of Edinburgh.

By weaving threads of atoms into the shape of five point stars, the researchers were able to create the building blocks for materials with superior flexibility, more versatility and a higher level of shock absorbency.

Using a technique known as self-assembly, they produced a chemical reaction in which atoms were chemically programmed to spontaneously wrap themselves up into the desired knot.

The scientists are hoping that the new molecules, known as pentafoil knots (pictured), will mimic the characteristics of complex knots found in proteins and DNA, which help to make some substances elastic.

They believe the breakthrough will make it easier for scientists to observe and understand exactly how entanglements influence a material's properties and therefore give manufacturer's greater control when designing new materials.

Principal researcher David Leigh, Forbes Professor of Organic Chemistry at the University of Edinburgh, said: "It's very early to say for sure, but the type of mechanical cross-linking we have just carried out could lead to very light but strong materials - something akin to a molecular chain mail.

"It could also produce materials with exceptional elastic or shock-absorbing properties because molecular knots and entanglements are intimately associated with those characteristics. By understanding better how those structures work - and being able to create them to order - we should be able to design materials that exploit those architectures with greater effect."

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<http://www.ed.ac.uk/>

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