

Super-materials made by silkworms

Researchers at the University of Oxford are looking to the natural world to create a new breed of exotic materials – and the applications seem limitless.



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Scientists often study natural products in order to genetically engineer them – with reasonable success. But a team at the University of Oxford believe that instead it is better to use the natural materials themselves – so researchers led by Professor Fritz Vollrath are working hard to develop new ways of using silk.

Silk is a superb material: light, strong, and highly elastic. But beneath an attractive exterior lurks a wealth of intricate properties. It has a nanocomposite structure, which provides its unique physical properties, and it is readily biodegradable and bio-compatible. From its raw form, it can even be washed and treated to tune its material properties – from super-strong to specifically biodegradable. This versatility has inspired one of the Silk Group's main research directions: biomedical implants.

In fact, this research has proven so successful that the team has a number of spin-out companies centred around the results. Orthox, for instance, casts silk into shapes suitable for use in replacement joints. The resulting implants replace damaged cartilage and, because they do not harm the body's

cells, not only provide tough replacement surfaces but also encourage regrowth of replacement tissue – over time becoming a living part of the body. Another spin-out, Neurotex, uses fine filaments of silk to bridge gaps in damaged nerves. Their experiments show that severed nerves grow along biocompatible silk filaments like plants along a trellis – and when connections are made, the nerves function again. Both of these technologies have shown great promise in preclinical trials, and will soon enter full clinical trials.

But that is not all the team is working on. At the core of the Silk Group's work is a passionate belief that silk is a material of the future – the basis of a broad range of objects not limited to medical implants, but from car panels to bike tyres. Silk is also highly sustainable: it is natural, environmentally friendly, and can potentially provide a wealth of green jobs. Combined with its incredible properties, it is a material hard to beat. The future is not made of silk yet – but part of it soon might be.

'Seldom does a scientist have the fundamental insights to substitute non-renewable raw materials and energy-intensive processes with natural ingredients. Professor Vollrath's fundamental insights have led to the design of an innovative business model. New silk-based materials are bound to impose themselves on the market – not because they are green, but because they are much better and more competitive.'

Professor Gunter Pauli, Founder of Zero Emissions Research & Initiatives

www.oxfordsilkgroup.com

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