

RISE TO THE CHALLENGE: INOV-8 / UNIVERSITY OF MANCHESTER

A collaboration between technical sportswear brand inov-8 and the UK's National Graphene Institute could herald the start of a new era for running and fitness footwear.

Graphene gives the gift of grip

by Adam Forster

Graphene may be the thinnest material on earth, just one-atom thick, but it is 200 times stronger than the strongest steel, a remarkable attribute which has resulted in a range of industries finding a use for it. Its growing presence in sportswear was highlighted in the WSA November/December 2017 and now the footwear industry looks set to be the next to sit up and take notice of its potential.

The first running and fitness shoes to incorporate graphene will go on sale in 2018 as the result of a partnership between technical sportswear brand inov-8 and experts at the University of Manchester in the UK. The university has grown into a global centre for graphene research since the revolutionary material was first isolated there in 2004 by scientists Andre Geim and Konstantin Novoselov, who were later awarded the Nobel Prize in Physics for their discovery.

The university's National Graphene Institute opened in 2015 thanks to funding from the UK government and the European Regional Development Fund. It provides a space for dedicated research into graphene and its

applications and has offered industry and university academics the opportunity to work together in this field. Since it was established, the institute has partnered with more than 60 companies from all over the world as they explore potential uses for graphene.

Its researchers have pioneered projects related to sports cars, medical devices and aeroplanes. More recently, they have led studies into how a graphene oxide ink could allow for flexible battery-like devices to be printed directly onto a textile substrate and into how a membrane made from graphene could be used to provide clean drinking water for millions of people who struggle to access clean water sources.

No more compromises

UK-based inov-8 is the latest company to tap into the graphene expertise of the University of Manchester. It has worked alongside researchers there to create a new outsole made from a graphene-enhanced rubber compound, which is said to exceed the performance of outsoles currently on the market. It has been developed exclusively for inov-8 and the brand also has a patent-pending graphene technology.

Inov-8 will incorporate a graphene-enhanced rubber outsole into three products from its G-Series range from July 2018.

 Inov-8

Michael Price, inov-8's product and marketing director, tells *WSA* the partnership began in September 2016 after the brand identified that graphene could be the missing link in its pursuit of footwear with the best possible grip. Design and development of the rubber compound and outsole got underway at the start of last year. Mr Price explains that the quick turnaround between inov-8 coming up with the idea and the creation of the first graphene-enhanced products is down to the University of Manchester being so fast and flexible. As a niche brand, inov-8 can match this flexibility, he adds, which is why the collaboration has been such a productive one.

Mr Price says off-road runners and fitness athletes, two of inov-8's most important consumer groups, have for too long been forced to compromise their need for better grip with the knowledge that rubber outsoles which offer this crucial quality are often prone to wearing down quickly. He believes inov-8's new outsole will make this compromise a thing of the past.

"The new rubber we have developed with the National Graphene Institute allows us to smash the limits of grip," he says, suggesting it will provide "significant benefits" for the brand's customers.

Laboratory tests, conducted at the university, have found outsoles made from the graphene-rubber compound are stronger, more stretchy and more resistant to wear than conventional rubber outsoles. The first shoes to feature them will be part of inov-8's G-Series range and will launch in July this year.

Dr Aravind Vijayaraghavan, reader in nanomaterials at the University of Manchester, explains: "When added to the rubber used in inov-8's G-Series shoes, graphene imparts all its properties, including its strength. Our unique formulation makes these outsoles 50% stronger, 50% more stretchy and 50% more resistant to wear than the corresponding industry standard rubber without graphene."

Graphene is "extraordinarily flexible, and can be bent, twisted, folded and stretched without incurring any damage," he adds. Graphene's flexibility helps the rubber to grip all kinds of surfaces more effectively while its resistance to damage means it will wear down less quickly.

"This is a revolutionary consumer product that will have a huge impact on the sports footwear market," Dr Vijayaraghavan predicts.

From fell running to CrossFit

Inov-8 will release three different products featuring outsoles made from the new graphene-rubber compound in this summer. The first will have a "really aggressive new outsole", Mr Price says, making it suitable for use in soft and muddy running conditions. He expects potential uses for

this shoe to include orienteering, fell running or obstacle course racing.

Another of the shoes will be aimed at the ultra-running and trail running market and will be suited for use over longer distances. The key here is the high flexibility of the outsole, Mr Price says; the graphene outsole will allow inov-8 to "change the way the athlete interacts with the terrain". The US will be the main target market for this product.

The third product will be an indoor fitness shoe aimed at the CrossFit market, a sector in which the brand already has a strong presence. Mr Price explains that the intensity of a CrossFit workout naturally results in heavy perspiration. This means the exercise surface can become very slippery, making footwear with good grip an essential requirement. This can help with things like better knee alignment, he states, helping to reduce the risk of injury for the wearer.

Understandably, Mr Price couldn't give *WSA* too many details about how the new outsoles are manufactured but confirmed: "It is more of a challenge to make than with standard rubber compounds." Inov-8 has been able to make them at its factories in China, he revealed.

The G-Series shoes have been ground tested in the US, the UK and Asia by some of Inov-8's most trusted athletes. They were chosen because of their close relationship with the brand as it sought to keep this "top secret project" under wraps. Mr Price says the feedback from the athletes has been very positive and has largely validated the conclusions drawn from the scientific testing carried out at the university. Testing is due to continue right up until the products are launched.

Limitless potential

Mr Price says inov-8 will definitely increase the use of graphene in its products in the future; the company expects 50% of its footwear range to be graphene-enhanced by 2020. "We will continue to innovate in the way that we use graphene over the coming three or four years," he tells *WSA*, adding that it intends to continue to "set the agenda" when it comes to the use of graphene in footwear.

Commenting on the collaboration with the National Graphene Institute, inov-8 chief executive Ian Bailey, said: "Product innovation is the number-one priority for our brand. It's the only way we can compete against the major sports brands. The pioneering collaboration between inov-8 and the University of Manchester puts us at the forefront of a graphene sports footwear revolution."

"This is just the start, as the potential of graphene really is limitless," he added. "We are so excited to see where this journey will take us." 



Inov-8 has been working on this "top secret project" with the University of Manchester since September 2016.

 Inov-8