This Radical Nanotechnology Is Only One-Atom-Thick

You're probably familiar with graphene – the one-atom-thick sheets of carbon. Graphene is one of the first applications of nanotechnology to achieve worldwide awareness – because it's useful for applications as varied as high-strength materials, and desalination. Even better, the UK is a world leader in graphene technology.

Today, I'm going to be speaking to Neill Ricketts, of Versarien. His firm is at the forefront of graphene research – so he's well placed to update us on the business case for this unusual new technology.

AL: Hi Neill. Can you start off by giving us a little bit about your background and how the business started?

NR: It started off with my chemistry teacher John Nettleship. He's actually the guy that JK Rowling modelled Professor Snape on. He set me up to do work experience, and after a few different placements I knew what I wanted. I wanted to make things that other people didn't know to make; I wanted to make those things we dreamed about a reality; I wanted to be an engineer like my father. Like everyone, my career wasn't a straight line. I made a lot of mistakes along the way, made some epic successes and learnt a lot at every turn. The one thing that was common was that I loved the challenge and that stood me in good stance to do what we have done over the last five or six years. I was a trapped spirit in the corporate world. I had built up a lot of experience, but I wanted to go it alone. So, I and a couple of colleagues broke away. It is never easy moving from a well-paid secure corporate job to the lonely and turbulent world of the startup scene.

AL: So, what does Versarien do?

NR: Well we spotted a gap in the market working with universities and commercialising their fantastic ideas. We are all about taking that idea, and turning it into a product that can be used. We do everything from parts for the oil and gas industry – to the guys in Manchester working with academics using graphene on the cure for cancer.

AL: Graphene has been in the news a lot – but isn't commercialisation years away?

NR: It is fair to say there has been a lot of excitement. Many columns have been written on this wonder material, since 2004 – when the guys at Manchester University first isolated it. The initial claims have taken a while to wash through – but the investment by central government in facilities like the National Graphene Institute (NGI) has turbocharged the progress. We are a little different to other propositions – having not only bases at University of Manchester and University of Cambridge, but having them as shareholders as well. Although we aren't cut any special breaks, we are right there in the centre of any action. We benefit from having access to some of the best academics in the world – and so much testing equipment it hurts! There is one microscope at the NGI that is over £2m. It's the only one in Europe I'm aware of, which looks at single atoms. Having spent a year working on getting the foundations right, we now have independent data for a whole range of materials reinforced with graphene. To be honest, we have been blown away with the results so far. We announced just before Christmas our largest order – and a very significant order globally – for the first real graphene product that demonstrates real performance gains. So, these products are starting to come, and they are coming quickly.

AL: That seems like a real step forward. What are you guys working on now?

NR: There doesn't seem to be enough hours in the day at the moment, but we need to stay really focused. There are literally thousands of potential applications. Lots of reports talk about the main uses, but we know our processes from Manchester suit carbon fibre composites, polymers and batteries. We operate a tiered system. Tier one is the "here and now". That's the stuff I am really into – the stuff we can make money from right now. That order I mentioned above was for a carbon fibre composite application. Frustratingly, we are often bound by non-disclosure agreements – and can't talk about some of the things we are working on. Tier 2 is the stuff that is a few years away that still needs work. At the moment batteries fit in here. Then we have Tier 3, which is developments that we want to do – but which are still a concept. This is where we use the institutes, and the great academics – like the big biomedical project we announced.

AL: You recently announced a new product, Nanene. Is that graphene, or something else?

NR: The truth is there are lots of different types of graphene. There are small ones, big ones, thin ones, fat ones, modified ones, natural, and synthetic. There are some that work, and some that just don't. In its purest sense, graphene is a single sheet of carbon atoms – that's 1/50,000 the thickness of a human hair. Our guys in Manchester transfer these sheets from one material to another. We started with this process – and we still provide these very high-quality materials to academics, for research.

The problem is that it is not possible to scale quickly, or cost-effectively. When we purchased 2-DTech, we realised they had a

great process for making tiny graphene platelets. Our team has worked hard to scale the process up, and move it into the production world. It is now a full-blown production process, in our factory in Cheltenham. The product this produces is unique and that is why we decided to give it its own identity: Nanene. It is very good at mixing into other chemicals, and doesn't need any further processing to get great results. Nanene is a few layers of graphene. That's relatively unique, in its own right – but, due to the process, it also has a unique set of properties. When we look for processes, we look for them to be simple, unique, protected and (most importantly) commercially viable at scale. This process ticked all our boxes – and, with a little luck, we nailed it.

AL: Didn't you also just announce another acquisition of a spin-out from the University of Cambridge?

NR: Yes, it was an amazing piece of good fortune. We know all the players in the graphene world. Cambridge are up there with the best. It is a very prestigious university, and the academics are some of the best in the world. We have kept in touch with them, but the timing has never been right – and then, boom, all the stars aligned. The have now proved their process for making graphene inks – and we now have the job to scale up that process. This product and process is quite different from our other process. It is very complimentary – and fits nicely with our technology roadmap for our 2D materials. Don't forget, graphene is only the first of a number of materials coming in this materials revolution.

AL: Graphene inks? What is that about?

NR: Imagine being able to print electronics with an inkjet printer; creating devices that have in-built sensors like clothing; or being able to assess fatigue data of composites in situ. As a kid, I was obsessed with science fiction, from the day my mum took me to see *Star Wars* at the cinema I looked at these devices and how they might work. Flexible displays, devices built into contact lenses, smart textiles, lightweight cars, and improved mobile devices – they will all need these types of materials. There are huge opportunities to exploit these materials in automotive and aerospace, but it is going to take time to get the necessary approvals. Consumer-related devices are coming much quicker. We are right at the heart of this – providing the enabling technology, in the form of these materials.

AL: Where is the competition coming from, and how big is the market for these wonder materials?

NR: The job we have now is to get the message out to as many people as possible as quickly as possible. The biggest risk is taking too long and watching the world overtake us. We are very lucky to have gained the support of the government – almost from when we started the business. They are being instrumental in putting us in the right places, to maximise our time and effectiveness. This is a worldwide opportunity, and the stakes are very high. In a recent future trend report, the amount of graphene required worldwide is likely to be in the order of 50,000 tonnes by 2025. We keep a close eye on the competition, we analyse and assess lots of materials, and we work very closely with our partners. It is really interesting that so many large OEM manufacturers are interested in working with a small company from Gloucestershire.

We'd love to hear your views on the investment opportunity offered by graphene. Please send feedback to andrew@southbankresearch.com.

Best,

Andrew Lockley
Exponential Investor