

ASK THE EXPERT

To navigate the fast-moving world of materials requires expert help and advice for the customer. Paul Fanning meets one of the experts.

Established in 1946, Goodfellow is a leading force in the UK and international materials market, offering more than 70,000 products. A key aspect of its success is its focus on research and innovation and a key reason for that success is its technical manager, Dr Aphrodite Tomou.

A materials scientist and engineer, Dr Tomou holds a master's in chemical synthesis of nanomaterials and another master's in the separation of metal thin films and a PhD in synthesis and characteristics of nanocomposites.

Her role at Goodfellow includes managing a team of technical specialists. She says: "I'm responsible for the innovative products we are implementing into our catalogue range. Also, my role includes suggesting to the customers which is the most suitable material for their application. Sometimes customers don't know what they should use – whether it should be a metal or a polymer or which type of metal or which alloy."

While there is an educational element to the work of Goodfellow's technical team, generally speaking Dr Tomou believes its customers are well-informed, but usually just need some guidance. The degree of consultation necessary depends on the customer, however. She says: "Usually if it's R&D and they're stuck – particularly if they want to find something out or if we have something new – they will approach us and tell us their requirements in terms of conditions, temperature, the environment, the forces, etc."

"And then there are some types of customers who say 'I want a ceramic and I want these criteria. Please can you suggest the right ceramic?'. Even then there is some work to be done. Someone can say 'I want a borosilicate glass', but there are many different types of borosilicate glass. Sometimes

they know they need to use a stainless steel, but not which one."

One area in which Dr Tomou has particular expertise is graphene, something she has been keen to make use of in her time at Goodfellow – in particular as it relates to the use of 'green' materials. "When I first joined Goodfellow," she says, "it had a range of graphene materials, but when I came I figured out we needed to do a little more with graphene. I had used pretty much every commercial variety at that stage, so I know the subject well."

"There is a material called green graphene, which had amazing properties. It was 'green' because it was not chemically synthesised. I thought we should bring this innovation in because the future is sustainable materials and materials that don't use chemicals and are environmentally friendly. I thought this green graphene would be a good investment for Goodfellow."

The material is useful for a range of applications, as Dr Tomou explains: "Its properties are good with regard to mechanical applications as it enhances mechanical properties – much like a polymer. I've also used it for conductive inks and it had excellent results there. Also, it's not floating, but after the application of a solvent liquid, it can be produced as a single-layer graphene, which is important in terms of its electrical



properties. Otherwise it has the mechanical properties one would expect with graphene and is very user-friendly."

While Goodfellow's product development is obviously customer-led to some extent, Dr Tomou is careful to make clear that its research efforts are very much based on the latest scientific developments. She says: "At Goodfellow, we're adding materials that are customer-led, but because I'm from a research background and I communicate with researchers, we are constantly looking at white papers. This means I have a good grasp of what is happening in the research sphere."

Keeping up with the latest research means that in terms of customer service there is a deep resource of knowledge that can be drawn on in response to customer enquiries – a fact that can reduce the timeframe of finding solutions considerably. "Sometimes, you just have the knowledge at your fingertips," says Dr Tomou. "So, for instance, there was an occasion where a customer had a composite and wanted to add graphene. Because I had the required knowledge, it was simply a discussion over the phone, an email and we were done. However, sometimes there are projects that can take much longer. Let's say we don't have the material, so we might have to look at how we can source it. That can take a while. In terms of finding a solution, nothing ever takes more than five days, but sometimes for the material to get to the customer it can depend on the requirements."

Even so, she does concede that there is still some lag between the development of the latest materials and their application in the real world. This is something she believes is improving, however.

"I think there is a gap between the research lab and the potential applications of something like

graphene and the actual utilisation of the material," she says. "So, yes, there is a knowledge gap. However, researchers now are now at a point where their understanding of the materials is much better and they now have a much clearer idea of how they can implement graphene in their applications. They're getting more knowledgeable. It helps that there are now high-profile examples such as Ford using graphene."

She is keen to make clear that graphene is far from being the only new and exciting group of materials. She says: "It's exciting that so many materials are now moving from the theoretical 'wonder material' stage into actual production. So, apart from graphene, you have multiwall carbon nanotubes, which although not as fashionable, actually have better electrical properties. And then there are boron nitride nanotubes, which we have great hopes for because – while they are insulators – they are neutron absorbers and so they have almost the same mechanical properties as graphene and can withstand higher temperatures. They can go up to 800°C, while graphene can go up to 300-400°C at most."

Overall, Dr Tomou believes that green materials, sustainability, 3D printing materials and nanocomposite materials are the most exciting areas of materials at the moment. And Goodfellow, she believes, is ideally placed to help customers explore them.

"We have a range of over 70,000 products that can be sent to you the next day if it's in stock," she asserts. "We have our technical team, which I think is one of the most important parts of what we do. There are only four people in the technical team itself, but virtually everyone in Goodfellow has a technical background, including sales and purchasing. We have experts in polymers, metals, nanomaterials and ceramics – so we have all the range of products covered." 

