

Nanotechnology

Summary

The strategic aim of Ulster University's Nanotechnology and Integrated Bioengineering Centre is to advance the understanding of nanomaterials for device fabrication and to promote its integration into advanced industrial manufacture.

The University's research includes diamond-like carbon (DLC) ultra-thin films, carbon nanotubes (CNT), graphene, silicon and metal oxide nanoparticles.

Impact

University research has resulted in direct uptake by major industrial manufacturers and led to a directly quantifiable socio-economic impact through added value, improved efficiencies and cost-savings, and has secured or boosted the employment of skilled engineering staff.

AVX

Ulster University has had links with AVX Ltd for over 25 years, most recently in a range of large-scale collaborative projects to improve the quality of dielectric layers in the Multi-Layer Ceramic Capacitors (MLCC) that the company produces in millions of units per day. This project led to major improvements in nanoparticle dispersion that AVX has fully integrated into its volume production lines.

In 2012 AVX co-funded a project on improving the base metal electrode (BME) system utilising nanoparticle nickel for MLCCs. This project has already identified improvements in BME ink formulation and processing, which has allowed the company to enhance manufacturing processes.

Knowledge gained through this collaboration has allowed AVX to gain credibility with customers such as NASA, BMW, Ford and the European Space Agency. These interactions have boosted international sales, growth, global market penetration and job sustainability. Joint publications, publicity and sponsored PhD programmes have also resulted.

SiSaf Ltd

SiSaf is a university spin-in company and is developing drug delivery formulations using a patented bioactive and non-toxic form of silicon nanoparticles ($\leq 50\text{nm}$) designed to allow compounds to penetrate the deeper layers of the skin without adverse effects.

SiSaf's laboratories are based at our Nanotechnology and Integrated Bioengineering Centre, where the two have jointly developed a wide range of capabilities in silicon nanoparticle production. This work has led to an expansion of SiSaf staff, increased research resources and enhancement of their patent, IP and knowledge assets.

SEAGATE

Our nanotechnology team was instrumental in persuading Seagate Technologies to locate a major production facility in the UK in 1994. The university's subsequent relationship with

Seagate was developed around nanoscale coatings of diamond-like carbon on GMR read-write head devices.

Our team utilised a novel plasma immersion technique that led to creation of ultra-hard layers (30 GPa) with a credible measured thickness of 1.5nm, the world's thinnest continuous carbon coatings. This world first technology was transferred to Seagate via a series of collaborative projects and subsequently ramped up to volume production.

Ulster University and Seagate are currently planning a range of new programmes of engagement in the area of with a focus on the university's proven nanomaterials capability.