Dr David Carlander updates International Innovation on the Association’s developments, and offers an insight into Europe’s latest nanotechnological innovations and their effective transfer to industry.
Can you begin by outlining your previous experience and role within the Nanotechnology Industries Association (NIA)?

I am the Director of Advocacy in NIA and my role covers the industrial sectors concerned with agriculture, food and feed as well as NIAs services in registration, evaluation, authorisation and restriction of chemicals (REACH) and nanomaterial safety. I coordinate and participate in a number of research projects, and I represent NIA at EU regulatory meetings (eg. Competent Authorities’ Sub Group on Nanomaterials under REACH) and at accredited stakeholder meetings organised by the European Chemicals Agency. Before joining NIA, I worked at the European Food Safety Authority (EFSA) in Parma, Italy, where I coordinated the risk assessment of applications of nanotechnologies in the food and feed area. At EFSA, I also worked with the ‘threshold of toxicological concern’ concept and was responsible for the risk assessment of animal cloning and genetically modified organisms. I hold an MSc in Biotechnology and have a PhD in Clinical Chemistry from Uppsala University, Sweden.

What are the overarching objectives of NIA?

NIA is the sector-independent, responsible voice for the industrial nanotechnologies supply chains. The Association supports the ongoing innovation and commercialisation of the next generation of technologies and promotes their safe and reliable advancement. NIA stands for a framework of shared principles for the safe, sustainable and socially supportive development and use of nanotechnologies. It works for a publically and regulatory supportive environment for the continuing advancement and establishment of nanotechnology innovation.

When we last spoke to NIA in 2013, the Association was soon to release a publication called ‘Closing the gap’. The impact of nanotechnologies on the global divide. Has progress been made in the past year to bridge this gap between low- and high-income countries?

NIA’s 2013 report ‘Closing the gap’ sets the scene for the use of nanotechnologies in the developing world. Nanotechnologies will not widen an existing gap, but they have the potential to significantly improve the living conditions of the poorest. Nanotechnologies are foreseen to deliver a positive impact on the reduction of global poverty and poor living conditions through new applications and devices that directly influence the lives of populations in the developing world; for example, there are devices set to improve water quality, facilitate the diagnosis and treatment of diseases, increase the efficiency of agriculture, and optimise energy consumption and production. The developing world is to seize the opportunity of appropriating nanotechnology for its own uses. Global inequality will not be widened by nanotechnology in and of itself; instead, it offers a positive influence in reducing the divide between the rich and the poor by providing new approaches to tackle the challenges faced by the developing world; as such, its impact will vary according to how it is implemented.

How is NIA supporting researchers striving to create new nanomaterials with improved characteristics in order to benefit nano-enhanced products in industry?

As a proactive industry association, NIA is participating in several research projects where technological material characteristics and innovative methods – e.g. for characterisation and testing of nanomaterials – are being developed. NIA participates in projects to foster a constructive discussion between nanotechnology industries, strategic placeholders and regulators. The application of the safe-by-design concept early in the innovation chain ensures that regulatory requirements are addressed at an early stage in product development, thus enabling a faster placing of products on the market.

What potential do nanophotonics have for delivering novel technological solutions?

Nanophotonics – the use of light with wavelengths in the nanometre range – is being used for several applications and allows for solutions such as the miniaturisation of detectors, with the accompanying benefits of smaller size, lower energy requirements and higher speed. Applications also involve photolithography to make very small transistors with features in the 20–30 nm range. In addition, nanophotonic know-how is an important aspect for developing efficient solar cells (photovoltaics).

Ecotoxicity of nanomaterials: the research gap

There is a growing concern about the lack of research on the ecotoxicity of nanomaterials and their impact on the environment and human health. To address this issue, the EU is channelling a large amount of research funds into developing an understanding of the potential toxicity of nanomaterials. While, at present, scientific publications indicate that there is no evidence of nanospecific toxicity mechanisms of action, continuing investment into toxicity research is being supported by the EU.

Research projects exploring this issue include:

- **MARINA**
  - Developing and validating the risk management methods for nanomaterials

- **NanoDefine**
  - Establishing methods that accurately identify, characterise and quantify nanomaterials to help address uncertainty of environment, health and safety

- **NANoREG**
  - Addressing the limited understanding of manufactured nanomaterial safety aspects along the value chain

The EU has compiled all nanosafety related research projects under the NanoSafety Cluster. The 2014 compendium of projects can be accessed here: [www.nanosafetycluster.eu](http://www.nanosafetycluster.eu)
The use of nanomaterials for enhancing energy storage, such as fuel cells and rechargeable batteries, is of current global interest. Can you discuss why this is the case and outline any recent developments in this area?

The use of nanotechnologies to miniaturise components and increase efficiency allows for several product improvements. Smaller components enable increased energy storage density and improved product characteristics based on nano properties. Nanotechnologies also allow the use of less expensive raw materials where new characteristics can be implemented to permit higher and more efficient energy storage. For example, the use of nanomaterials has improved the safety and durability of lithium-based batteries; nanomaterials in battery components provide a smarter use of energy in batteries, which consequently offers greater value for the consumer and potentially larger margins for manufacturers. Moreover, it reveals new options for the advancement of energy storage devices through the development of fuel cell and super capacitor technology.

**NIA symposium**

The symposium, ‘Expert Analysis on Nano-Regulation and -Policy: Staying Ahead of the Curve’ – held on 19 November 2014 – addressed the changing regulatory landscape for nanotechnologies worldwide, with Europe remaining at the forefront of legislative developments in the area, and with individual Member States as well as the European Commission looking to develop and improve their governance systems.

The symposium explored four key topics:

1. The new Belgian register of nanomaterials
2. Proposed modification of REACH annexes
3. The EC’s recommendation for a definition of nanomaterials
4. Issues pertaining to the communication of regulatory matters with the public

What challenges is the nanotechnology industry facing? How does the Association seek to overcome these problems?

There is a concern within the industry that regulatory policy discussions are creating an added layer of complexity and red tape for nanomaterials when compared with conventional chemical substances. The current EU regulatory framework is fit to handle nanomaterials, but the increased pressure from policy makers for product labelling and requirements that are already in place for registers and annual notifications increases cost, uncertainty and burdens for industry.

Does the Association have plans for the near future you would like to share? Are there any upcoming projects you are particularly excited about?

NIA anticipates a strengthening of its public outreach, alongside its continuing stewardship of nanotechnology-enabled applications in a growing number of industrial market sectors. In this course, the Association specifically focuses on the collaborative approaches to its work within the nanotechnology stakeholder community. Through NIA-initiated public-private partnerships, as well as publicly-funded projects, NIA seeks to work with a wide range of stakeholders in pursuing the responsible development and commercialisation of nanotechnologies. In the NANOReg project (www.nanoreg.eu), for example, NIA is collaborating with European and Member State regulators on a common approach for the regulatory testing of manufactured nanomaterials. The project is set up to ‘test the tests’ by using the same nanomaterials for the testing, harmonised standard operating procedures and common guidance shared by all partners involved. NIA will shortly start several new projects and partnerships with academic institutions and industries to address topics ranging from safety by design to explaining nanotechnology and its applications to the public.