LGC supporting innovation: working with Malvern Instruments

Through LGC's measurement science function, we have contributed to expanding the capabilities of a novel nanoparticle tracking technology.

Department for Business, Energy & Industrial Strategy

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Background

Nanomaterials are increasingly being used in everyday life, present in over 1300 commercial products from the medicines to food. The global market for nanotechnology is estimated to grow to $75.8 billion by 2020, and comprise more than 400 companies.

As the impact of nanotechnologies on human life becomes more prevalent, it is becoming increasingly important to be able to characterise nanomaterials within biological systems and understand their behaviour. Recent EU regulation states that cosmetics, foods and biocides are defined as nanomaterials when more than half the particles are between 1 and 100 nm in size. To support this regulation and enable effective labelling, both the size distribution and the number of particles must be accurately identified.

Impact

Working with Malvern Instruments, researchers at LGC investigated the potential of the Nanoparticle Tracking Analysis (NTA) system to address this measurement challenge and provide both size distribution and number-based measurements for nanoparticles.

As one of the early adopters of NTA technology, feedback from LGC measurement scientists helped inform software upgrades that enhanced the capabilities of the instrument, allowing nanoparticle populations to be more accurately measured in the high serum concentrations that reflect conditions in nanotoxicology models.

By coupling the NTA system to advanced separation (asymmetric flow field-flow fractionation) and inorganic mass spectrometry (ICP-MS) techniques, researchers at LGC, in collaboration with Malvern Instruments, were able to accurately determine a number-based concentration for silica nanoparticles in a complex biological sample without the need for pre-treatment (Bartczak et al, Anal Chem (2015) 87(11)5482-85).

Based on our experience with NTA technology, LGC was one of the laboratories selected by Malvern to beta-test the flow-based concentration upgrade (now commercially available) that improves the reproducibility of the NTA particle counting, validating its robustness.

Having demonstrated its measurement potential, the use of NTA will be compared with other nanoparticle characterisation technologies, such as small angle x-ray scattering, CPS, DLS and single-particle ICP-MS, in the current European Metrology Programme for Innovation and Research (EMPIR) project 'Metrology for innovative nanoparticles'. The uncertainty, accuracy and metrological performance of the different techniques will be assessed and the results used to develop best practice guidance for nanoparticle characterisation for end-users to support trade in high performance nanoparticles for advanced technologies and improve the competitiveness of European nanotechnology industries.

Phil Vincent, Development Scientist at Malvern Instruments Ltd describes the impact LGC scientists have had:

" LGC have provided expert application support to aid the development of our nanoparticle tracking technology. Their forward thinking approach has made them willing candidates for beta testing new concepts and providing valuable feedback which has helped shape parts of our technology."

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4944/CB/0816