IL19 SINGLE-EVENT ICP-MASS SPECTROMETRY ANALYSIS: FASTER DATA ACQUISITION SPEED OPENS THE WAY TO NOVEL APPLICATIONS. **Eduardo Bolea-Fernandez**, Ana Rua-Ibarz, Lieve Balcaen, Thibaut Van Acker, Tong Liu and Frank Vanhaecke, Ghent University, Department of Chemistry, Atomic & Mass Spectrometry – A&MS research group, Campus Sterre, Krijgslaan 281-S12, 9000 Ghent, Belgium; Christophe Mangodt and Olivier De Wever, Ghent University, Department of Human Structure and Repair, Laboratory of Experimental Cancer Research – LECR, C. Heymanslaan 10, 9000 Ghent, Belgium; Glenn Woods, Agilent Technologies LDA UK Ltd, 5500 Lakeside, Cheadle Royal Business Park, SK8 3GR, Stockport, Cheshire, UK; Diego Leite, Maite Aramendía and Martín Resano, University of Zaragoza, Aragón Institute of Engineering Research (I3A), Department of Analytical Chemistry, Pedro Cerbuna 12, 50009 Zaragoza, Spain; Milica Velimirovic and Kristof Tirez, Flemish Institute for Technological Research (VITO), Boeretang 200, 2400 Mol, Belgium; Eduardo.BoleaFernandez@UGent.be

ICP-mass spectrometry (ICP-MS) is a versatile and powerful technique for trace elemental and isotopic analysis. For many years, ICP-MS has been deployed with the aim of providing average (bulk) information on the elemental composition of homogeneous aqueous solutions. At present however, the ability of modern ICP-MS instrumentation to acquire data at unprecedented speed has paved the way for extracting new types of information from heterogeneous suspensions. This new approach is called single-event ICP-MS and makes use of short temporally resolved signals to provide information on composition, element content(s) and/or size of discrete entities, such as engineered nanoparticles (ENPs), micro/nano-plastics (MNPs), and individual cells, and particle number density and mass concentration of the suspensions they are present in. The use of ICP-MS operated in single-event mode can thus be exploited in various contexts, as will be exemplified in this presentation by discussing different applications carried out within the Atomic & Mass Spectrometry research unit at Ghent University. Particular attention will be paid to the challenges encountered when dealing with very short transient ion signals, but also to the new possibilities offered by this novel approach and to its future potential.

In the context of characterization of ENPs, challenges arise when the target NPs deviate from the widely used Ag and Au NPs to other NP types that suffer from the occurrence of spectral interferences (e.g., Fe_2O_3 or SiO_2 NPs). To overcome spectral overlap, while still preserving the fast-scanning frequency that characterizes this approach, the use of high-end ICP-MS instrumentation relying on the use of either chemical or physical resolution has been evaluated [1-3].

In addition to ENPs, we have recently demonstrated the potential of single-event ICP-MS for MNPs characterization [4]. The method, relying on the ultra-fast (100 μs dwell time) monitoring of $^{13}C^+$, was found to be suitable for the accurate determination of the particle number concentration (PNC), as demonstrated by the agreement between the number of events detected via $^{13}C^+$ and $^{165}Ho^+$ monitoring for 2.5 μm lanthanide doped polystyrene microspheres. Furthermore, size and size distribution, and mass concentration results were obtained via comparison between MPs of different sizes. Building on this discovery, further progress has been made and the current status of MNPs characterization via ICP-MS will be reviewed.

Last but not least, ICP-MS is also promising for single-cell analysis. However, this represents a far greater challenge, as the composition of a cell is typically far more complex than that of an ENP, the content of the mineral elements is vastly lower, and cells are larger and more fragile entities than ENPs. In this presentation, examples of

single-cell ICP-MS applications for the quantitative determination of exogenous and endogenous elements will be provided, and the technical aspects that allow this approach will be highlighted [5].

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