MULTI-ELEMENT ANALYSIS OF NANOPARTICLES WITH A TIME OF FLIGHT ICP-MS CAPABLE OF CONTINUOUS DATA ACQUISITION OF 10 - 30 KHZ READOUT SPEED

ARIANE DONARD[1], MICKAEL THARAUD[2], MARC F. BENEDETTI[2] PHIL SHAW [1]

[1] Nu Instruments, 74 Clywedog Rd South, Wrexham Industrial Estate, Wrexham LL13 9XS, United Kingdom ariane.donard@ametek.com

[2]Universite´ de Paris, Institut de physique du globe de Paris, CNRS, F-75005 Paris, France,

The single particle data acquisition technique was developed on quadrupole and high resolution ICP-MS with the start of the art data acquisition rates in the tens of kHz proving powerful at being able to differentiate nanoparticles from ionic background signals. The technique can accurately count particle numbers and sizes in a widening range of matrices. However, the information provided is incomplete as the analysis is single element, which leaves many questions unanswered in terms of particle associations. Attempts have been made to measure two elements in individual particles using fast jumping quadrupole ICP-MS, but the results are qualitative at best and have severe limitations in reduction in sensitivity. The ideal is to use a fast data acquisition mass spectrometer such as a time of flight (TOF). This work will present data from a new design of TOF-ICP-MS Vitesse from Nu Instruments where it is possible to collect data at 5 to 25.5ms spectra acquisition speeds (1-40 kHz data read-out rate from accumulated spectra) with continuous, uninterrupted streaming of data for long periods. The hardware and acquisition methodology will be described with examples of how the design allows fast data collection for wide mass ranges at nominal sensitivity and up to five times greater sensitivity by reducing the mass range being measured. Data is transferred to and processed within a new version of Nu Quant software, which extends the single particle mode for multi-element analysis. As an example of application, the capability of the instrument for identification of colloidal mineral phases in natural samples will be demonstrated.