Department of Food Science & Agricultural Chemistry

Mass Spectrometry Seminar

September 26th 2018, 12.30-1.30 PM

Faculty Lounge MS 2-022

Single particle inductively coupled mass spectrometry for the determination of nanoparticle sizes and concentrations

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ABSTRACT: Single particle ICP-MS is a promising technique used to determine nanoparticle (NP) concentrations and size distributions in environmental and biological media. It is generally acknowledged that the smallest nanoparticles are the most reactive and thus are likely to pose the greatest environmental and biological risk. However, the lower limit of particle sizes that can be detected by SP-ICP-MS will depend on the signal to noise, which is often limiting for the lighter elements or highly soluble nanoparticles. For example, using a quadrupole ICP-MS, size distributions are only possible for TiO_2 nanoparticles above ~60 nm. Three strategies have been employed in our lab in order to increase S:N: (i) the use of a sector field instrument; (ii) the generation of dry aerosols and (iii) the removal of dissolved metal. For example, by coupling a desolvatation membrane to a quadrupole ICP-MS, it was possible to increase measurement sensitivity in order to enable the determination of TiO_2 NP as small as 24 nm (and CeO_2, Ag and Au nanoparticles as small as 5 nm). For the TiO_2 NP, the use of a sector field ICP-MS increased sensitivity further (^{49}Ti: 35 cps/ppt in wet mode; 890 cps/ppt in dry mode), allowing us to attain sizes as small as 15.6 nm. Since the detection of very small NP is also influenced by the background (instrumental and dissolved metal), results will also be presented on the data treatment and reduction of dissolved metal.

BIO: Kevin Wilkinson is a professor in the Chemistry Department at the University of Montreal since 2005. Prior to that, he was a junior faculty member at the University of Geneva for the 10 years following his postdoctoral fellowship. Dr. Wilkinson's work is in the environmental field, roughly split between the development of analytical techniques and the understanding of environmental processes. Present work examines the bioavailability and mobility of rare earth metals and nanomaterials in environmental (and biological) media. He runs one of the best equipped laboratories in Canada for the characterization of nanoparticles (CACEN: Center for the characterization of environmental nanomaterials), which performs analysis for both private and public partners.

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