Contribution ID: **78** Type: **Invited Lecture**

OPENING LECTURE - Nuclear and radioanalytical techniques in nanotoxicology research

Wednesday 19 September 2012 14:50 (20 minutes)

Currently, enormous progress is being made in producing a great number of nanomaterials. However, in spite of hundreds of nano-products produced and currently available on the market a huge health and safety questions remain unsolved, and the assessment of possible health risks of nanoscale materials before they become ubiquitous in every aspects of life is necessary. In order to reach this goal nanotoxicology research has become a new frontier for a scientifically-based assessment of the environmental and human health impact of nanomaterials and nanoparticles (NP). In this context, there are a large number of challenges for the analytical chemist involved in the different steps of nanotoxicology research such as the physico-chemical characterization of NP and their use in in vivo and in vitro experiments with laboratory animals and cellular moedels (behaviour in biological media, toxicokinetics, uptake in whole tissue/ cells, intracellular distribution, binding with biomolecules). However, nanotoxicology research has a strong multidisciplinary character and requires an integrated use of different analytical techniques such as spectrochemical, nuclear and radiochemical, specialized microscopy, bioanalytical, and molecular biology techniques.
The aim of this work is to highlight the potential role that nuclear and radiochemical techniques plays in mechanistically-based nano(eco)toxicology research carried out at ECSIN in collaboration with the radiochemical laboratory of the University of Milan-INFN Section.
Applications carried out are based on the use of radioactive metallic zerovalent or metal oxide NP (¹⁹⁸AuNPs, ^{110m}AgNPs, ⁶⁰CoNPs, ⁵⁹FeNP, ⁵⁸NiNPs and ⁵⁷Co⁵⁹Fe<s as radiolabelled by neutron irradiation or via radiochemical synthesis by no-carrier-added (NCA) radiotracers.
The need of a new specialized figure of radiochemist, the radionanoanalytical chemist, will be also stressed.

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Session Classification: Session 9 - Applications of radiotracers and nanoparticles

Track Classification: Applications of radioactive tracers and nanoparticles