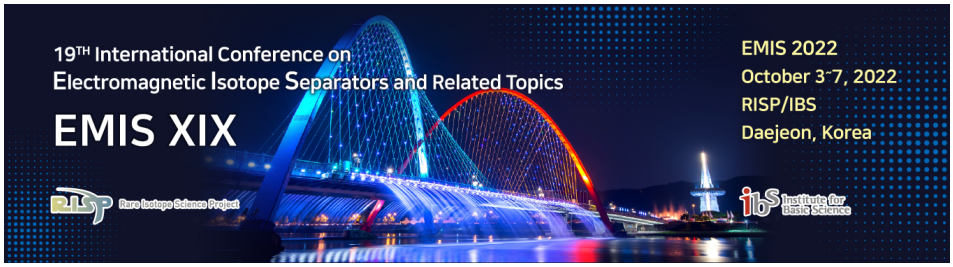

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Little-known ways to apply nuclear physics techniques to chemistry and medicine

Thursday, 6 October 2022 16:50 (30 minutes)

As humans, we are a mixture of diverse chemical elements, a fragile composition that hangs in an improbable yet finely tuned balance. If this is disturbed, either due to a deficiency or excess of certain elements, it can lead to pathologies which have been linked to severe diseases such as cancer, Alzheimer's disease, or Parkinson's disease. For many metals in our body, such as Mg, Zn and Cu, the absence of convenient physical and spectroscopic properties with which to study them has held back a detailed understanding of their role in health and disease.

Nuclear magnetic resonance (NMR) spectroscopy is a powerful technique for studying the structure and dynamics of metal-binding biomolecules in solution. In practice, however, NMR suffers from poor sensitivity for several elements. Beta-radiation detected NMR (β-NMR) spectroscopy is a lesser-known analogue of NMR which requires radioactive isotopes rather than stable ones, offers a billion-fold is based on the detection of beta-particles emitted anisotropically by spin polarized nuclei. The combination of nuclear spin polarization and high detection efficiency of beta-particles gives rise to a billion-fold or higher increase in sensitivity, and it allows for interrogation of elements which are otherwise difficult to access.

In this presentation, I will demonstrate the potential of the β-NMR technique and highlight recent β-NMR experiments with biomolecules in solutions.

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