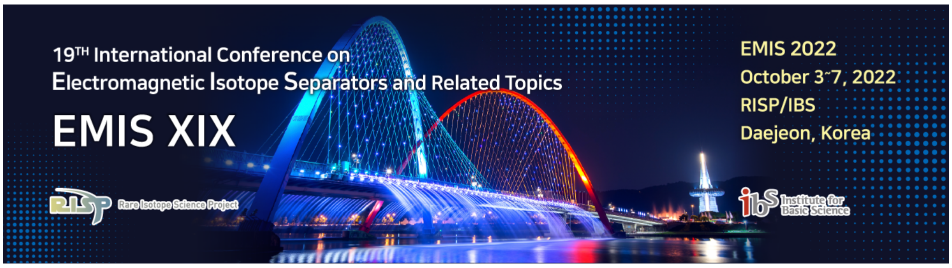

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β-NMR measurements of neutron-rich ^{21}O isotope for nuclear structure and materials science studies

Tuesday, 4 October 2022 22:16 (8 minutes)

In this interdisciplinary project, we investigate the nuclear structure of ^{21}O by measuring the ground-state electromagnetic moments using the combined technique of fragmentation-induced spin polarization and β-nuclear magnetic resonance (β-NMR) method. However, the ^{21}O isotope is not only important in such nuclear physics studies but also holds large potential importance in materials science. The fundamental importance of oxide-based systems both in technology and basic science has been strongly recognized, so that oxygen NMR (nuclear magnetic resonance) and NQR (nuclear quadrupole resonance) spectroscopy emerge as vital tools for materials characterization. NMR/NQR offers an element-specific, atomic-scale probe of the local environment, providing a powerful tool to probe local structure, local electric/magnetic field, and dynamics in solids. In spite of the almost ubiquitous presence of oxygen in inorganic and organic compounds, oxygen NMR/NQR studies have been relatively scarce in comparison with other nuclei. This is primarily due to the low natural abundance of the NMR-active isotope ^{17}O (0.038%). Isotopic enrichment is therefore necessary, often at considerable cost and efforts. Hence, the situation requires that artificial oxygen isotopes should be used by means of β-NMR/NQR, in which the nuclear spin precession signal is detected through the beta decay of a radioactive nucleus. This study will open new perspectives for condensed matter physicists and solid-state chemists to study oxide materials. The physics background, experimental methods and present status of the project will be covered in the presentation.

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