Seminar

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Institute for Plasma Research

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Title: Use of stable isotopes for failure detection and tracing of biomaterials

Speaker: Dr. Barti Malvi
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Date: 13th May 2024 (Monday)

Time: 03.30 PM

Venue: Committee Room 1, IPR

Abstract

Metal-stable isotopic tracers have emerged as a promising technique for studying various processes and systems, including biomedical applications. This work explores the utilization of metal-stable isotopes as tracers for early failure detection of biomedical implants. The presentation highlights the methodology of introducing traceable isotopes into implant materials, such as copper (^{65}Cu) and silver (^{109}Ag), which offer non-toxic, easily detectable, and low-abundance properties conducive to tracking degradation. Techniques for introducing these isotopes into different materials, including metals, polymers, and ceramics, are discussed. The research investigates the degradation behavior of biomedical materials under various conditions, simulating the physiological environment. Monitoring degradation over time and analyzing degradation products through mass spectrometry techniques enable quantitative assessment of material degradation. Additionally, scanning electron microscopy is employed to analyze the degraded surface morphology of the materials. The results demonstrate the effectiveness of metal-stable isotopic tracers in assessing the degradation of biomedical materials, providing insights otherwise unattainable due to their internal placement in the body. Successful introduction and detection of stable isotopes in biomaterial degradation products, such as SS316L and PMMA bone cement, illustrate the potential of this approach for early failure detection of implants and tracing degradation product movement within the body. The quantitative approach presented offers a reliable and accurate method for assessing the failure of biomedical implants, aiding in preventive measures to mitigate potential health risks and complications for patients. Overall, this research contributes to advancing failure detection methods for biomedical implants, enhancing patient safety and implant longevity.