Contribution ID: **34** Type: **not specified**

Raman and FTIR spectra analysis of radiation effects on neutron-irradiated CVD diamond crystals

This study investigates the radiation response of Chemical Vapor Deposition (CVD) diamond, a crucial detector material at CERN. Utilizing Raman, Fourier Transformation Infrared (FTIR), and Luminescence Spectroscopy, we analyzed both non-irradiated and neutron-irradiated CVD diamond samples. The focus was on comparing spectral characteristics, specifically variations in band positions and intensities, to understand radiation-induced structural deformations and defects.

The research aims to decode the structural changes within CVD diamond due to irradiation. This is vital for gauging its radiation resistance, a key attribute for its application in CERN's demanding environment. We also performed a dose-dependent analysis, linking spectral attributes to neutron irradiation levels. This not only underscores the material's radiation sensitivity but also offers a quantitative framework for evaluating its structural changes under radiation exposure.

The study significantly enhances our understanding of CVD diamond's viability as a radiation-resistant detector in high-energy experiments. This has implications beyond CERN, including potential applications in fields requiring radiation-resistant materials, such as nuclear engineering and medical radiation therapy. Overall, the findings set a strong foundation for developing durable materials capable of withstanding extreme radiation conditions, thereby contributing to advances in both detector technology and material and medical sciences.
This research is supported by Latvian Research Program "High-energy physics and accelerator technologies" (Agreement No: VPP-IZM-CERN-2022/1-0001).

Type of contribution

Talk

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