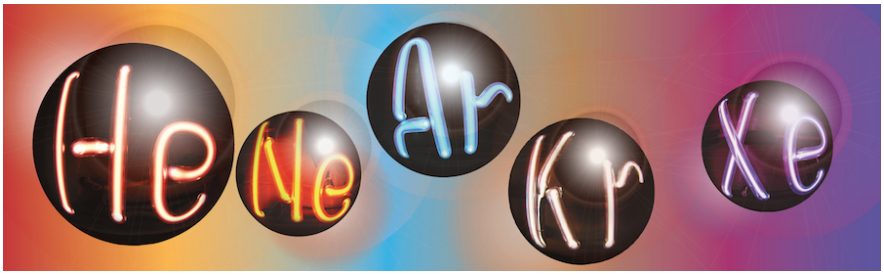

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Reporting on wavelength shifters sublimation on high vacuum

Monday 26 August 2024 17:50 (20 minutes)

Liquid noble detectors are highly dependent on wavelength shifter materials, such as p-Terphenyl (pTP) and tetra-phenyl-butadine (TPB). These materials are key to the DUNE's far detector (for the former) and the DUNE's near detector, the SBDN and ICARUS (for the latter), for instance. Given their significance, it is of extreme importance to fully comprehend and characterize these compounds to optimize experimental techniques and enhance detector performance.

Our investigation reveals a novel phenomenon where commonly used wavelength shifters can undergo spontaneous sublimation when exposed to high vacuum. This work presents our findings on the sublimation behavior of pTP and TPB under such extreme conditions. We have quantified the sublimation rate of these substances as a function of pressures and temperatures, and assessed this phenomenon's influence on the growth of these materials, affecting their physical properties. Furthermore, we have studied the impact of variations in the characteristics of pTP and TPB thin films, such as sample thickness and growth rate, on the sublimation process.

Based on our results, we propose methodologies to mitigate the sublimation effects during the production and storage of wavelength shifter thin films. These insights could improve the reliability and efficiency of these materials in advanced photodetection systems, cheapening the creation of experiments necessitating these technologies, and creating new possibilities for particle detection

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