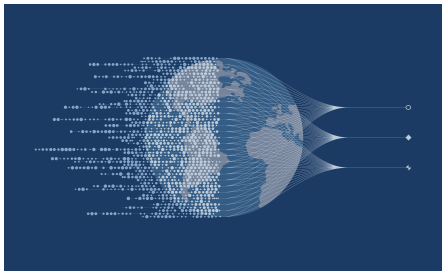

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Increasing the resolution of a scintillation detection cell using a diffuse reflective coating and assessment of the retention of performance characteristics during aging of a protective coating made of poly-chloro-para-xylylene

Wednesday 10 September 2025 11:00 (1 hour)

Modern systems for detecting radioactive noble gas isotopes require high sensitivity, reliability and durability. One of the critical challenges is minimizing the memory effect, which manifests itself as residual activity on the surface of the detectors. Previously, VNIIA developed a barrier coating technology for scintillation cells using poly-chloro-para-xylylene, known for its high gas barrier properties, chemical resistance and durability. Applying a 4–5 μm coating reduced the memory effect by 78%, while a 7–8 μm coating achieved an 89% reduction but compromised resolution and efficiency of the detector.

This study aimed to enhance the efficiency of detectors by using a diffuse reflective layer based on barium sulfate. This material, with high reflectivity and resistance to environmental impacts, improved scintillation signal registration efficiency by 50%. Aging stability was also examined, with results showing that after 2.5 years of natural aging, detector efficiency remained at 99% of its original level. Accelerated aging tests indicated a 5–7% decrease in efficiency over ten years.

The findings demonstrate the effectiveness of the applied solutions, including barium sulfate and poly-chloro-para-xylylene barrier coatings, ensuring reliable, long-term performance in radiation monitoring systems. These results confirm the potential for sustained operational reliability under various environmental conditions.

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