SnT 2025
8 SEPTEMBER ONLINE DAY
9 TO 12 SEPTEMBER AT HOFBURG PALACE, VIENNA & ONLINE
CTBT: SCIENCE AND TECHNOLOGY CONFERENCE

P3.2-508

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

A.V. Sokovishin[1], D.I. Yurkov[1], D.E. Ergashev[1], O.A. Gerasimchuk[1],
O.V. Tkachev[1], I.A. Kryuchkov[1], M.S. Orlov[1], A.M. Desyatskova[1], A.A. Protsko[1]

[1]FSUE “Dukhov All-Russian Research Institute of Automation” (VNIIA)

INTRODUCTION AND MAIN RESULTS

This study demonstrates a 50% increase in scintillation signal efficiency using a barium sulfate diffuse reflective coating and confirms the long-term stability of poly(chloro-para-xylylene) barrier films. Results show no significant degradation after natural and accelerated aging, ensuring reliable detector performance for radiation monitoring systems.

SnT 2025
8 SEPTEMBER ONLINE DAY
9 TO 12 SEPTEMBER AT HOFBURG PALACE, VIENNA & ONLINE
CTBT: SCIENCE AND TECHNOLOGY CONFERENCE

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

A.V. Sokovishin[1], D.I. Yurkov[1], D.E. Ergashev[1], O.A. Gerasimchuk[1], O.V. Tkachev[1], I.A. Kryuchkov[1], M.S. Orlov[1], A.M. Desyatskova[1], A.A. Protsko[1]

P3.2-508

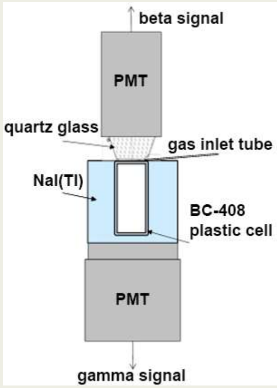
Radionuclide Technologies and Applications

Background & Objectives

•Scintillation detectors for radioactive xenon must combine high sensitivity, reliability, and durability.
•Critical issue: memory effect (residual activity on detector surfaces).
•VNIIA developed Parylene C barrier coatings, reducing memory effect up to 89%, but at the cost of resolution.
•Objectives:

- Enhance light collection using a diffuse $BaSO_4$ reflective layer.
- Assess aging stability of Parylene C coatings under natural & accelerated conditions.

Simplified schematic of the MIKS beta–gamma detector



Radionuclide Technologies and Applications

•Samples studied:

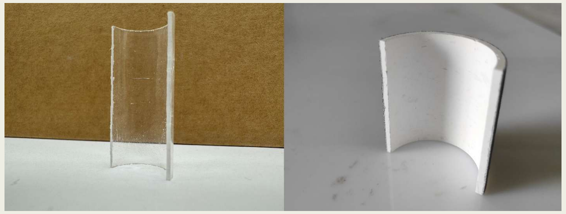
- Fresh Parylene C–coated scintillator.
- Aged sample (operated since 2021).
- Scintillator with $BaSO_4$ diffuse reflective layer.

•Techniques:

- Transmission & reflectance spectroscopy (250–2500 nm).
- FT-IR spectroscopy (4000–600 cm^{-1}).
- Accelerated aging at 120 °C for 1000 h (Arrhenius extrapolation ≈10 years).

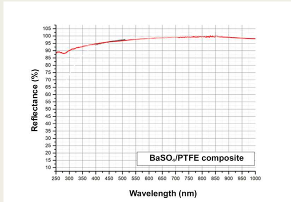
•Diagnostics: coating thickness, transparency, IR band stability.

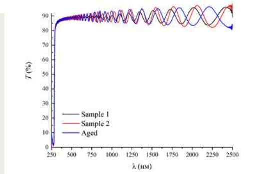
Elements of the scintillation detector



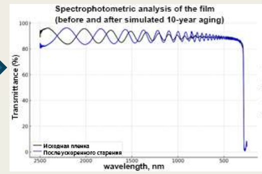
Radionuclide Technologies and Applications

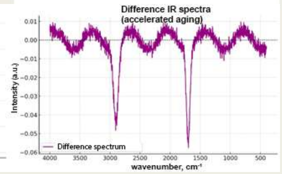
Optical spectra of protective coatings: $BaSO_4$/PTFE reflectance (left) and Parylene C transmission before/after aging





Spectroscopic stability of Parylene C after simulated 10-year aging





•$BaSO_4$ coating: +50% scintillation signal efficiency.
•Parylene C barrier: properties stable after 4 years natural aging.
•Accelerated tests: only 5–7% transparency loss over simulated 10 years.
•IR analysis: no significant chemical degradation observed.
•Conclusion: Combining $BaSO_4$ diffuse layer + Parylene C barrier provides high efficiency and long-term stability, suitable for radiation monitoring systems.