TechBriefs

Savannah River National Laboratory

U.S. DEPARTMENT OF ENERGY • SAVANNAH RIVER SITE • AIKEN • SC

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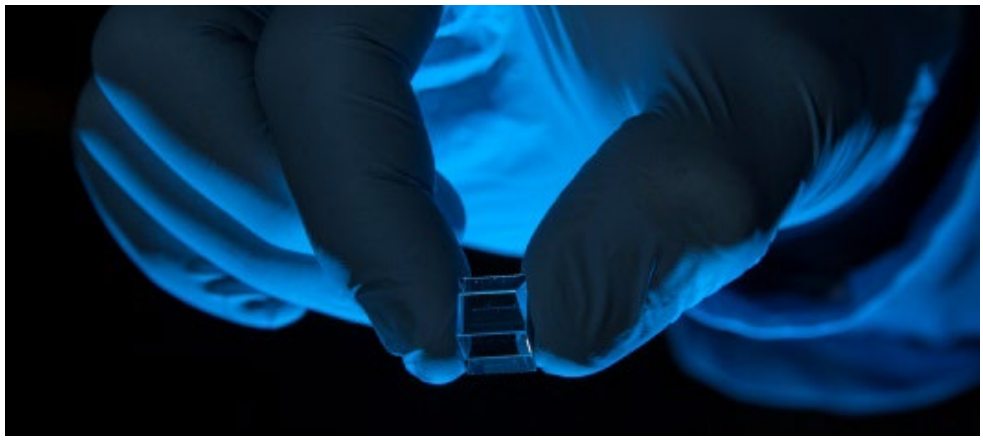
At a glance

- Convenient
- Low cost
- Resists extreme conditions
- Adaptable to current instrumentation
- Increased detection area
- U.S. Patent 9,103,921 B2



Photonic Crystal Scintillator

Researchers at the Savannah River National Laboratory (SRNL) have developed significant energy resolution enhancement of scintillation-based detectors by increasing photon yield.

Background

Next generation scintillators will require improved detection sensitivity of weak gamma ray sources, thermal neutrons and rapid unambiguous isotope identification. These are principally dependent on the energy resolution and timing resolution, of the detector. The best energy resolution of a scintillator detector is achieved with maximized photon yields, which are critically limited by total internal reflection within the scintillator. This leads to a lower number of scintillation photons reaching the photodetector, resulting in an undesirable decrease in the energy resolution of the scintillation counter.

Contact Information

Partnering Opportunities

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Technology transfer

The Savannah River National Laboratory (SRNL) is the U.S. Department of Energy's (DOE) applied research and development laboratory at the Savannah River Site (SRS).

With its wide spectrum of expertise in areas such as homeland security, hydrogen technology, materials, sensors, and environmental science, SRNL's cutting edge technology delivers high dividends to its customers.

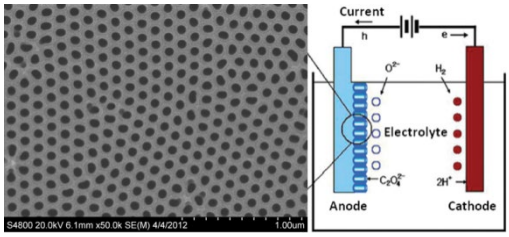
The management and operating contractor for SRNL is Battelle Savannah River Alliance, LLC. BSRA is responsible for transferring its technologies to the private sector so that these technologies may have the collateral benefit of enhancing U.S. economic competitiveness.

A better alternative

This application uses photonic crystals (PhCs) for enhanced light outcoupling from the scintillator surface. PhCs allow for efficient light extraction through two-dimesional nanoscale patterns on the scintillator, which inhibit light propagation along directions transverse to the surface and lead to redistribution of saved energy. SRNL has developed a convenient low-cost method for creating these nanoscale patterns using a highly ordered porous anodic alumina membrane as a selective dry etching mask for large-area pattern transfer.

Applicable uses

This technology would be useful to both government and commercial customers. This PhC fabrication method could be used by various scintillator manufacturers. Various government and safeguards programs could apply this scintillator detector application for verification and monitoring activities, such as radiation portals, On-Dock Rail, enhancements to hand-held digital gamma spectrometers with multiple scintillators to detect enrichment levels. Potential government customers could use this application for non-destructive assay of dry cask storage systems via these detectors.



Nanoporous anodic alumina templates for PhC pattern transfer

Partnering opportunities

SRNL invites interested companies with proven capabilities in this area of expertise to develop commercial applications for this process under a cooperative research and development agreement (CRADA) or licensing agreement. Companies Interested in licensing will be requested to submit a business plan setting forth company qualifications, strategies, activities, and milestones for commercializing this invention. Qualifications should include past experience at bringing similar products to market, reasonable schedule for product launch, sufficient manufacturing capacity, established distribution networks, and evidence of sufficient financial resources for product development and launch.

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