

# Lithiated Glass Scintillating-Particle Neutron Detector

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## Technology Summary

A unique neutron detector developed at ORNL features a matrix material that uses scintillating particles, suspended in glass, to detect neutron radiation. The technology enables a wide variety of non-neutron scintillators to be used for neutron detection, with properties tooled for the specific type of detection required. This detector holds significant potential in future security monitoring, medical technology, and scientific research applications.

Neutrons travel through matter without ionizing, making neutron "events" difficult to detect using conventional methods. The ORNL invention uses a matrix material developed from glass that has been loaded with a high concentration of lithium-6, a neutron-absorbing material. A scintillating material in the form of micron-sized particles is embedded in this matrix. These particles give off light when an electron, a proton, a triton, an alpha particle, or a fission fragment crosses their paths, indicating the presence of neutrons.

The configured detecting material is placed near at least one detector element sensitive to light, which produces an electrical signal when a neutron is absorbed. Multiple detector elements can rapidly accumulate data from a chamber. At least one detector element can also feature first and second arrays of optical fibers, spaced apart so that the optical pulses within the neutron-detecting material couple into at least one fiber. This positions the neutron absorption in an x-y plane.

## Advantages

- Allows materials previously unavailable for neutron detection to be used
- Expands the range of scintillating particles that can be used for detection (limited only by compatibility with current sol-gel methodology)

## Potential Applications

- Two-dimensional position-sensitive neutron detection
- Neutron detection and counting in health physics and health industry applications
- Detection of fissile and fissionable material in security applications

## Patent

Steven Wallace, *Neutron Detection Using Lithiated Glass-Scintillating Particle Composite*, U.S. Patent 7,582,880, issued September 1, 2009.

## Inventor Point of Contact

Sheng Dai  
Chemical Sciences Division  
Oak Ridge National Laboratory

## Licensing Contact

Jennifer Tonzello Caldwell  
Group Leader, Technology Commercialization  
UT-Battelle, LLC  
Oak Ridge National Laboratory  
Office Phone: 865.574.4180  
E-mail: [caldwelljt@ornl.gov](mailto:caldwelljt@ornl.gov)

