

SILICON-BASED NEUTRON DETECTOR

Patent Pending

Technology Readiness Level: 2

Technology concept and/or application formulated

TECHNOLOGY DESCRIPTION

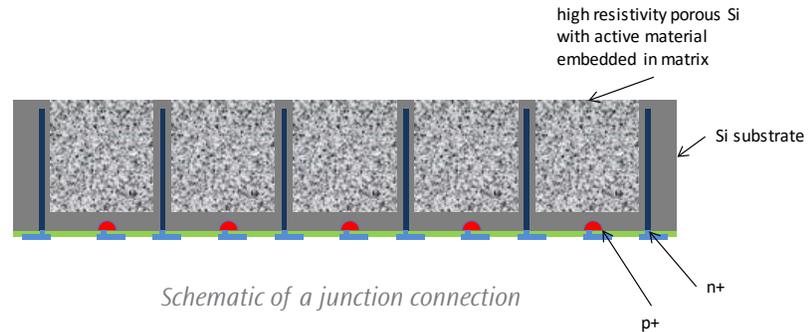
Sandia National Labs has expanded upon research into microstructured semiconductor neutron detectors and created a silicon-based device with greater sensitivity than the current state-of-the-art with adaptability for detection of general particles/radiation.

Sandia's neutron detector is designed with a plurality of vertical pores filled with neutron-sensitive converter material inside a single crystal silicon detector. The pores are less than 5 μm to ensure penetration of the reaction by-products after neutron absorption to enter into the silicon detector region for increased efficiency. These pores are generated using established methods of manufacturing (porous silicon etching or deep reactive ion etch). This design allows for a high fill ratio of neutron sensitive material in close proximity to the detector material (silicon) which is essential to create a highly efficient detector.

Each individual detector pixel creates a 2-D array which can then be stacked to form a 3-D array for full volume detection and tracking of fragments. This detector has much higher resolution and allows for novel measurements to be carried out compared to single monolithic detector with the same volume.

On board electronics, built into the silicon wafer, can make for a sensor which can be included in a watch, sole of a shoe, or belt buckle for unobtrusive fielding with low-power usage.

Our rugged, compact neutron detector can also be easily adapted to detect general particles/radiation by modifying or removing the sensitive materials.



TECHNOLOGICAL BENEFITS

- Efficiencies greater than 5% are expected with this technique
- Rugged, compact
- Manufactured using established methods
- Adaptable for variety of radiation detection

POTENTIAL APPLICATIONS

- National defense & security
- Medical
- Public safety
- Nuclear nonproliferation

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