

Novel Silicon Radiation Detector Enabled By Tunnel Oxide Passivating Contact

Weakening of radiation detection performance

Silicon detectors have become predominant for many radiation detection applications since the 1960s, including heavy charged particles, alpha particles and fission fragments. Conventional silicon radiation detectors featuring a typical p-n junction suffer from serious Auger recombination in the doped layers and metal-induced recombination beneath electrode contact areas, which weakens their detection performance.

Tunnel oxide passivating contact for silicon radiation detectors

Innovators at Georgia Tech have developed a novel silicon detector enabled by tunnel oxide passivating contact. The passivated silicon surface leads to low surface leakage current near the front contact. Additionally, this facilitates one-dimensional current flow through the silicon surface leading to a low effective contact resistivity. This would lead to lower leakage current, lower noise level, and higher energy resolution for widespread applications in charged particle spectroscopy and identification.

Summary Bullets

- The technology passivates the bottom surface well and suppresses electron recombination near the bottom contact, resulting in low leakage current.
- Passivating the silicon surface and decreasing hole recombination near the front contact leads to low recombination current density at the surface and low effective contact resistivity.
- An extremely low J_0 for the tunnel oxide passivating contact on both sides yields a higher energy resolution and lower noise level.

Solution Advantages

- **Low leakage current:** The technology passivates the bottom surface well and suppresses electron recombination near the bottom contact, resulting in low leakage current.
- **Low effective contact resistivity:** Passivating the silicon surface and decreasing hole recombination near the front contact leads to low recombination current density at the surface and low effective contact

resistivity.

- **Higher energy resolution and lower noise level:** extremely low J0 for the tunnel oxide passivating contact on both sides yields a higher energy resolution and lower noise level.

Potential Commercial Applications

- Radiation detection and measurement applications
- General or alpha particle spectroscopy
- Alpha particles and fission fragment spectroscopy
- X-ray spectroscopy in hospitals and health care centers, personnel monitors

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IP Status

<p>Patent application has been filed</p>: US63/500306

Publications

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Images

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