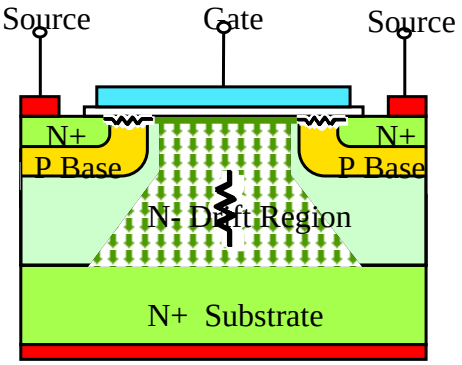
Silicon-Carbide Power Electronics



ORNL has developed a novel processing technique to minimize roughening of the SiC interface during activation annealing.

Goal

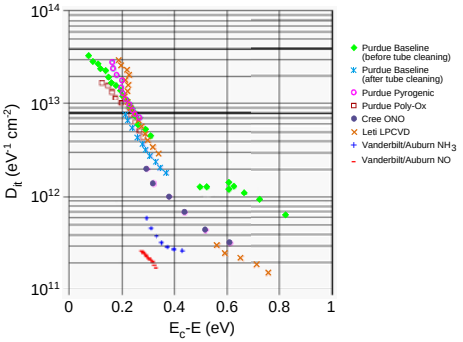
Optimize the atoms-to-systems development of high-temperature MOSFET-based power electronic circuits for use in high-power commercial applications.

Objective

Integrate SiC-based power electronics fabricated using state-of-the-art processing technology developed at ORNL into power management modules to increase system performance.

Technology Description

- ORNL's Solid State Division has developed a novel low-temperature processing technique that minimizes roughening of the interface during activation annealing
- Collaborator Vanderbilt University has developed a method to reduce damage during ion implantation
- UT and ORNL will develop novel circuit and gate-driver topologies to take advantage of the special properties of SiC-based power switches



Vanderbilt University holds the world record for minimum interface defect density in SiC materials.

Technology Importance

- SiC-based power electronics will allow the reduction in size/weight of modules by 3X
- Operating temperature range up to 500°C
- Reduces losses by a factor of 10X
- Increase power capabilities by a factor of 100X

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