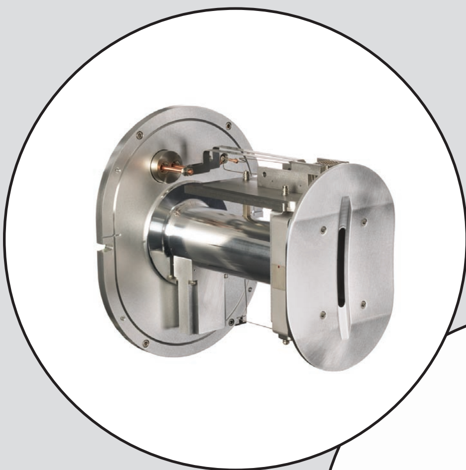
The Cluster Implant *Source*

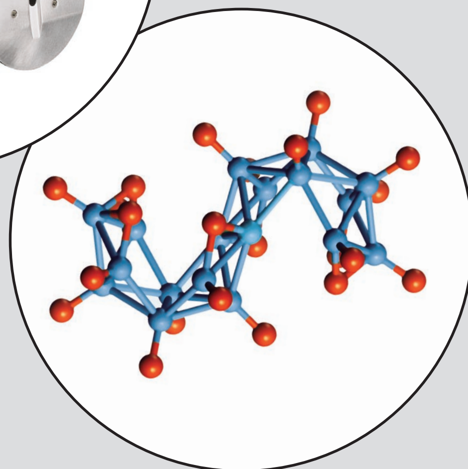
New Source

New Material

New Productivity

New Thinking





SemEquip

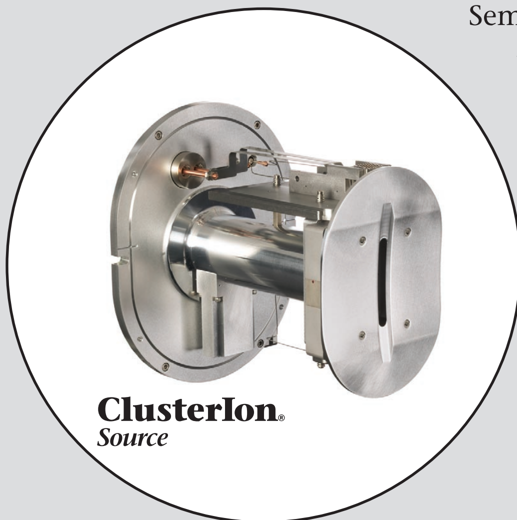
Face The Big Challenges

SemEquip understands the challenges facing semiconductor manufacturers to continue to deliver smaller, faster, lower power devices at lower prices. We also understand that low energy, high dose ion implantation on traditional platforms is reaching cost prohibitive productivity levels.

In recent years, productivity improvements have come from advances in beam line and end station design. While these advances have had a positive effect, they cannot keep pace with the production throughput requirements for the increased doses at low energies that today's smaller, faster, lower power devices demand.

Conventional implant equipment uses deceleration mode in an attempt to achieve reasonable throughput performance for high dose, low energy implants. Unfortunately, the results neither meet productivity nor quality requirements. Deceleration results in energy contamination which makes ultra shallow junction (USJ) formation impractical.

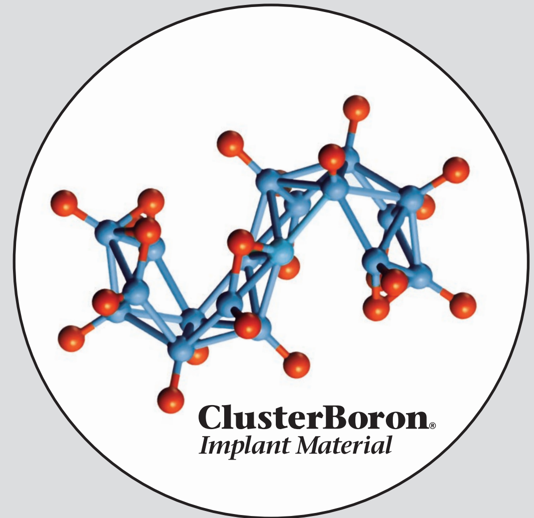
New Source



SemEquip's ClusterIon® Source leverages existing ion implantation beamline technology enabling the commercial use of cluster ion implantation. SemEquip's patented soft ionization technology delivers n-type and p-type clusters of dopant atoms, allowing the ion implant tool to operate at much higher extraction voltage while multiplying the effective beam current at the wafer by the number of dopant atoms in the cluster. SemEquip's ClusterIon® Source eliminates the need for deceleration, as the energy of the implant is spread evenly across all Boron atoms in the molecule.

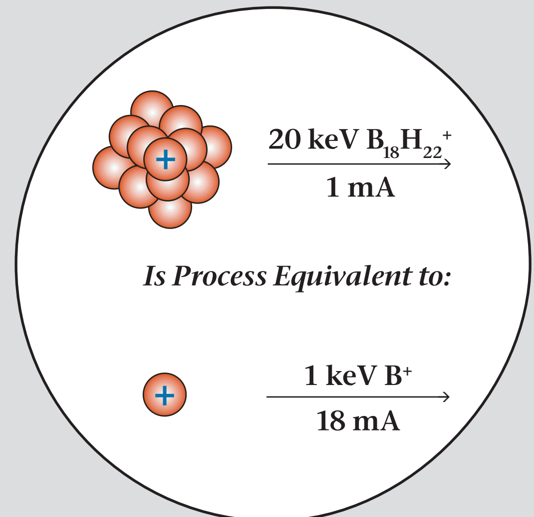
New Materials

SemEquip's revolutionary ClusterBoron® Implant Material has 18 boron atoms per molecule. The single charge of the ClusterBoron® molecule results in low angular divergence of the ion beam due to reduced space charge. The energy of any implanted molecule is partitioned according to the relative masses of the atoms. For example, leading edge source drain extension (SDE) applications require implants in the 200 eV range, which is a challenge for current ion implant tools. In a 4 keV implant of ClusterBoron®, each boron atom has an implant energy of 200 eV. This allows the ion implant tool to operate at 4 keV while delivering a process equivalent boron implantation energy of 200 eV.



New Productivity

The ClusterIon® Source delivers mechanical limit throughputs for most implants and it can deliver greater than 50 wafers per hour (1E16 dose) for the demanding dual poly gate doping process. This productivity is achieved without compromising the precise dose control, ability to implant at high tilt angle, and with the mass analysis of conventional ion implantation systems. Recent work by leading-edge device manufacturers has shown that cluster implants produce significantly less channeling than conventional implants. This means that a Germanium pre-amorphization implant (PAI) may not be required for USJ formation. Eliminating this extra implantation step not only reduces cost, but avoids the end-of-range defects and accompanying increased leakage often associated with the PAI.



New Thinking

SemEquip's ClusterIon® Source combined with existing ion implantation beamline technology meets the market requirements for dual poly gate and source/drain extension implants. The combination of zero energy contamination and reduced channeling produces the shallowest junctions possible. SemEquip leverages existing ion implantation processes, equipment, facilities, and expertise to deliver the highest throughput and best beam quality.

The ClusterIon® Source provides revolutionary performance from evolutionary technology advancements. Contact your ion implantation equipment supplier to learn more about improving your implant throughput with ClusterIon® Source Technology. Contact SemEquip to learn more about our innovative ion source and implant material technologies.

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