Production of High Quality Germanium Crystals

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Inventors
- Dongming Mei, PhD
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Field
- Physics
- Materials Science

Technology
- Germanium Crystal Production

Applications
Crystals
- Radiation Detectors
- Infrared Systems
- Transistors

Wafers
- Sensors
- Semiconductors

Status
- Seeking research and development and/or licensing partner

Patent Status
- US and International patents are pending.

This new method uses a quartz shield to isolate the germanium that would otherwise be contaminated by the stainless steel chamber, insulation materials, or the graphite crucible. Drs Mei and Wang also determined that use of a load scale can control the crystal diameter and ensure that all melted germanium is used in crystal production and thus removed from the crucible. Their apparatus pictured here enables operators with minimal training to produce high purity germanium crystals as large as or larger than those commercially available. Growth diameters range from four to twelve centimeters; an energy resolution of 0.15% at 1.333 MeV with FWHM 2.02 keV has been reached. Efforts to improve purity, size, and energy resolution are ongoing.

High purity germanium crystals can be used in rare event physics experiments such as detection of dark matter, neutrinoless double-beta decay, neutrino coherent scattering, and etc; the sensitivity of detectors is proportional to the size of the crystal, so being able to produce larger crystals is a distinct advantage to this technology. Germanium crystals are also used in thermal-IR and monitor cameras, pyrometry, automotive sensors, high-performance solar cells, medicine, night-vision equipment, and high-performance lasers. Germanium wafers, produced as a byproduct of this process, are also useful in numerous military and commercial applications.