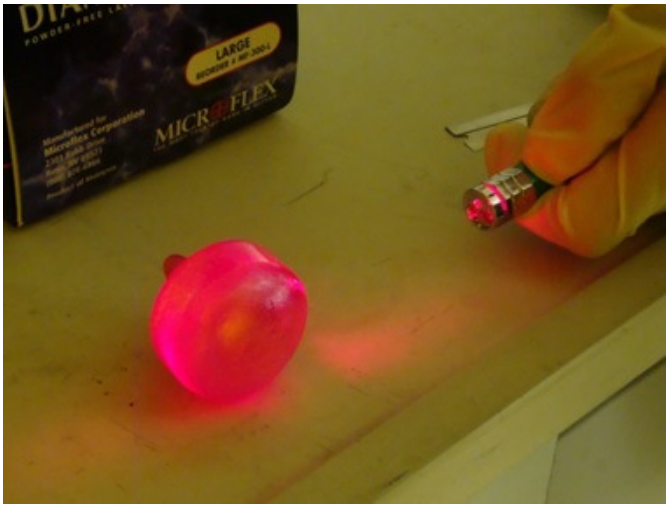
Radiation Detectors Help NASA Understand Planets from Orbiters and Landers

Mercurous halide-based radiation detectors
Brimrose Corporation of America,
Sparks, MD
410-472-7070
www.brimrose.com

Brimrose is developing radiation detectors that can improve NASA's ability to determine surface and subsurface composition of planetary bodies from orbiters and landers. Unlike most radiation detectors, these detectors can perform both gamma and neutron spectroscopy. The new detectors are based on mercurous halide materials. The mercurous halides are new wide bandgap semiconductor detector materials that can provide radiation detection with low cost, high performance and long-term stability.



Mercurous halide imaging-quality crystals grown by physical vapor transport.

The specific focus of the project will be on the material engineering aspect of the detector material. This involves crystal growth and post-growth processing, as well as focus on the detector fabrication and system design. The direct purpose is to outfit NASA's orbiters and landers for space planetology. Specifically, the detectors can be used to determine the surface and sub-surface composition of planetary bodies via both gamma spectroscopy and neutron spectroscopy.

Current radiation detectors used in space missions, both scintillation-based detectors and semiconductor detectors, are mostly based on technologies developed decades ago. Each of the detectors can only satisfy some of the desirable properties mentioned while having many limitations. Current detector systems therefore have to be designed with multiple detector materials. This is inconvenient for spaceflight, where power consumption, weight and volume are at a premium.

Mercurous halide materials are non-hygroscopic and non-toxic, and hence very stable for long-term operation. They are mechanically stronger, and have a much higher density value. The materials are also radiation hard, and have a bandgap that is compatible with ASIC electronics due to its lower dark leakage current.

www.techbriefs.com
NASA Tech Briefs, January 2016

Reprinted with permission from *NASA Tech Briefs*, Vol. 40, No. 1, page 18-19.