Accurate Gamma-Ray Spectroscope for Compositional Analysis of Celestial Bodies

VANDERBILT UNIVERSITY
CTTC Center for Technology Transfer & Commercialization

Summary

Vanderbilt and Fisk University researchers have developed a new type of gamma ray spectroscope (GRS) that overcomes the limitations of current systems. This type of GRS can be used to accurately determine the subsurface chemical composition of celestial bodies in the solar system.

Addressed Need

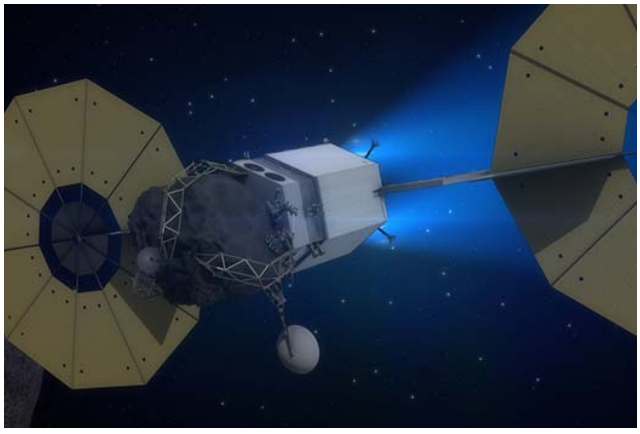
Some of the asteroids in the solar system are easy to access and they may be potential targets for mining and exploration. Gamma-ray spectroscopy is commonly used to determine the composition of the surface of planets and asteroids but the instruments currently in use suffer from a number of drawbacks. They are bulky, energy–intensive systems that require cryogenic cooling. Additionally, due to lack of appropriate scintillator crystals, their resolution is poor resulting in inaccurate information about the asteroid's composition.

Technology Description

The technology developed at Vanderbilt and Fisk Universities employs a new type of scintillator crystal (Europium-doped Strontium Iodide - $SrI_2(Eu)$). This crystal can operate at higher temperatures than other materials eliminating the need for cooling. It has a high stopping power for gamma rays and emits in the blue part of the spectrum, making it ideal for use with solid state photodetectors. This reduces significantly the overall power consumption and size of the spectroscope. In addition, the system's high energy resolution provides for high detection sensitivity, sufficient to easily detect all elements of interest.

Technology Features

- Low energy consumption (less than 3 Watts)
- Small size (system weighs less than 2 lbs.)
- High detection sensitivity
- High threshold for radiation damage
- No self-activity



Intellectual Property Status

A patent application has been filed.

Technology Development Status

A prototype was built and tested.

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