Development of Radioluminescent Tritium Polymeric Material for High Visibility Applications

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Project Background

- A radioluminescent tritium polymer material capable of surviving multiple space environments could fulfill visibility requirements levied on space flight hardware and facilitate additional long term internal and external lighting needs for each mission.

Project Goals

- Identify base material for coating.
- Determine the best size, shape, amount, and color of lights for various lighting needs.
- Run tests on the material/light combination to select the best candidate for further advanced testing.

Current Industry Applications

- Tritium light sources are used in items such as emergency exit signs and watch faces, and as a very reliable source of low intensity light for items such as gun sites and navigational compasses

Potential In-Space & Lunar Applications

- Facilitate long term internal and external lighting needs for:
  - Imaging
  - Docking
  - Tracking
  - Color indicators — Such as outside the ISS
  - EMU suits for lunar exploration on the moon
- Polymeric material provides adhesion benefits and the potential to protect the tritium lights from degradation due to UV

Underway and Upcoming Tests

- Light box comparison
- Radiometry measurements
- Adhesion strength tape test
- Film material development and testing
- Thermal vacuum
- UV exposure
- Materials Exposure Technology Innovation in Space-3
- Materials International Space Station Experiment-20

Scientific Background

- Tritium or hydrogen-three is a radioactive isotope of hydrogen that emits beta particles as it undergoes a process called beta decay.
  - Half life of 12.3 years
- A beta particle is a high-energy, high-speed electron (or positron) emitted from radioactive decay of an atomic nucleus.
- Because it is a gas, tritium must be bound to a material or encapsulated in a sealed glass container.
- The gaseous tritium can then be combined with a phosphor source which when struck with beta particles, fluoresces and emits light. Such a light source is referred to as a gaseous tritium light source (GTLS).

Polymer encapsulated hairlight and disk lights with and without UV light