This technology provides an alternative to vapor deposition that may provide equally active catalysts.

A hydrogenation catalyst including a base material coated with a catalytic metal is made using mechanical milling techniques. The hydrogenation catalysts are used as an excellent catalyst for the dehalogenation of contaminated compounds and the remediation of other industrial compounds. The mechanical milling technique is simpler and cheaper than previously used methods for producing hydrogenation catalysts.

Preferably, the hydrogenation catalyst is a bimetallic particle formed from a zero-valent iron or zero-valent magnesium particle coated with palladium that is impregnated onto a high-surface-area graphite support. The zero-valent metal particles should be microscale or nanoscale zero-valent magnesium or zero-valent iron particles. Other zero-valent metal particles and combinations may be used. Additionally, the base material may be selected from a variety of minerals including, but not limited to, alumina and zeolites. The catalytic metal is preferably selected from the group consisting of noble metals and transition metals, preferably palladium.

The mechanical milling process includes milling the base material with a catalytic metal impregnated into a high-surface-area support to form the hydrogenation catalyst. In a preferred mechanical milling process, a zero-valent metal particle is provided as the base material, preferably having a particle size of less than about 10 microns, preferably 0.1 to 10 microns or smaller, prior to milling. The catalytic metal is supported on a conductive carbon support structure prior to milling. For example, palladium may be impregnated on a graphite support. Other support structures such as semiconductive metal oxides may also be used.

This work was done by Jacqueline Quinn of Kennedy Space Center and Cherie Geiger and Christian Clausen of the University of Central Florida. For more information, contact the KSC Technology Transfer Office at (321) 867-5033. KSC-12978

Phase Change Material for Temperature Control of Imager or Sounder on GOES Type Satellites in GEO

Goddard Space Flight Center, Greenbelt, Maryland

An imager or sounder on satellites, such as the Geostationary Operational Environmental Satellite (GOES), in geostationary orbit (GEO) has a scan mirror and motor in the scan cavity. The GEO orbit is 24 hours long. During part of the orbit, direct sunlight enters the scan aperture and adds heat to components in the scan cavity. Solar heating also increases the scan motor temperature. Overheating of the scan motor could reduce its reliability. For GOES-N to P, a radiator with a thermal louver rejects the solar heat absorbed to keep the scan cavity cool. A sunshield shields the radiator/louver from the Sun. This innovation uses phase change material (PCM) in the scan cavity to maintain the temperature stability of the scan mirror and motor.

When sunlight enters the scan aperture, solar heating causes the PCM to melt. When sunlight stops entering the scan aperture, the PCM releases the thermal energy stored to keep the components in the scan cavity warm. It reduces the heater power required to make up the heat lost by radiation to space through the aperture. This is a major advantage when compared to a radiator/louver. PCM is compact because it has a high solid-to-liquid enthalpy. Also, it could be spread out in the scan cavity. This is another advantage. Paraffin wax is a good PCM candidate, with high solid-to-liquid enthalpy, which is about 225 kJ/kg.

For GOES-N to P, a radiator with a louver rejects the solar heat that enters the aperture to keep the scan cavity cool. For the remainder of the orbit, sunlight does not enter the scan aperture. However, the radiator/louver continues radiating heat to space because the louver effective emittance is about 0.12, even if the louver is fully closed. This requires makeup heater power to maintain the temperature within the stability range.

This work was done by Michael Choi of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-16546-1