NASA Nanotechnology Space Sensor Test Successful in Orbit

NASA recently tested the first nanotechnology-based electronic device to fly in space. The test showed that the "nanosensor" could monitor trace gases inside a spaceship. This technology could lead to smaller, more capable environmental monitors and smoke detectors in future crew habitats.

NASA's Nano ChemSensor Unit hitched a ride to Earth orbit on March 9, 2007, as a secondary payload experiment on the U.S. Naval Academy's MidSTAR-1 satellite. The sensor test was powered on May 24.

"The nanosensor worked successfully in space," said Jing Li, a scientist at NASA's Ames Research Center in California's Silicon Valley. Li is the principal investigator for the test. "We demonstrated that nanosensors can survive in space conditions and the extreme vibrations and gravity change that occur during launch," she said.

On long missions in space, harmful chemical contaminants may build up gradually in the crew's air supply. Nanosensors will be able to detect minute amounts of these contaminants and alert the crew that there may be a problem.

The goal of the experiment was to prove that nanosensors, made of tiny carbon nanotubes coated with sensing materials, could withstand the rigors of space flight. Li's experiment also helped scientists learn how well a nanosensor could endure microgravity, heat and cosmic radiation in space.

Scientists use a specific sensing material for each chemical they wish to detect. When a trace chemical touches the sensing material, it can trigger a chemical reaction that causes electric current flowing through the sensor to increase or decrease.

To conduct the sensor test in space, nitrogen gas containing 20 parts per million of nitrogen dioxide was injected into a small chamber. The chamber also held a computer test chip with 32 nanosensors. The test measured the change in electricity passing through the nanosensors after the nitrogen dioxide and the sensing materials made contact.

The change was similar to the effect fluctuating electrical current has on a light bulb. Changes in the bulb's brightness correspond to the number of chemical molecules detected.

Less than a half-inch across, the test chip with its 32 nanosensors is smaller and less costly than other analytical instruments that could be used for the same measurements. Other advantages of nanosensors include low power use and durability.

Scientists have developed chemical sensors using carbon nanotubes and other nanostructures to detect ammonia, nitrogen oxides, hydrogen peroxide, hydrocarbons, volatile organic compounds and other gases.

Source: NASA