



Health, Medicine and Biotechnology

Accurate Measurement of O-phthalaldehyde (OPA) Concentration for Disinfection Applications

Analytical Process for Accurately Measuring OPA

On the International Space Station (ISS), waste heat loads are removed by an Internal Active Thermal Control System (IATCS) which is a water based system. O-phthalaldehyde (OPA), commonly used as a high-level disinfectant in the medical industry, is used in the IATCS water based system as a biocide to prevent negative impacts to coolant flow, heat transfer and corrosion, all of which could result in damage to IATCS and adversely affect crew health and safety. Therefore, the concentration of OPA in the coolant fluid is important to maintain optimum function of the IATCS. To address this critical need for ISS, a simple inexpensive, National Institute of Standards and Technology (NIST) traceable process to analyze OPA that neither required highly hazardous chemicals nor involved a hazardous waste stream, was developed.

BENEFITS

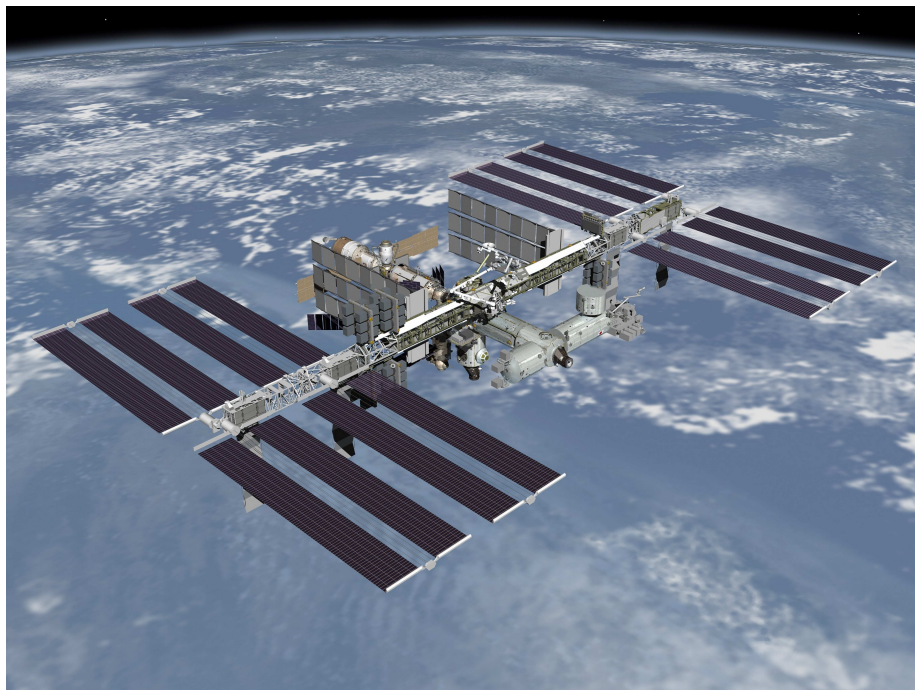
- ➔ Cost-Efficient Design: Easy, inexpensive process; analytical method for previously used process was proprietary and costly
- ➔ Innovative Utility: Reversed a NIST traceable EPA method for quantitation to develop method
- ➔ Data Sensitivity: NIST traceable process can verify with precision and accuracy
- ➔ Novel Approach: Previous techniques were labor intensive and hazardous
- ➔ Safe: Does not produce a hazardous waste stream

technology solution



THE TECHNOLOGY

A variety of biocides were tested to determine bacterial disinfection capability, material compatibility, stability, solubility, impact on coolant toxicity hazard level, and impact on environmental control and life support systems to identify an acceptable biocidal agent for use in IATCS on ISS. OPA was selected and is used in a water solution to effectively inhibit the growth of microorganisms in the IATCS coolant. If accumulation occurred, material degradation could result, and should IATCS become damaged, crew health and safety would be at risk. Therefore, the concentration of OPA in the coolant fluid is critical to maintaining proper IATCS performance. Previously used methods for developing, analyzing and validating OPA concentrations had been a proprietary process no longer available to NASA. Subsequent literature searches only provided a technical method that was labor intensive and involved using hazardous materials. OPA is approved for use at concentrations 109 ppm. To achieve this, a National Institute of Standards and Technology (NIST) traceable EPA method, (Method 547), for quantitating glyphosate concentration in water, which uses High Pressure Liquid Chromatography (HPLC) to convert glycine (not glyphosate) in a post-column reactor into a compound that can be more readily detected, was reversed engineered. By reversing the premise of this process, glycine is reacted in excess with the OPA solution along with 2-mercapto-ethanol. In this way, a simple, inexpensive, and reliable methodology for analyzing low-to mid-level concentrations of OPA for use in IATCS coolant water is now available.



International Space Station.

APPLICATIONS

The technology has several potential applications:

- There is potential for use in the medical industry, i.e. urological instrumentation, endoscopes and other heat-sensitive, semi-critical medical devices, as well as for cleaning, disinfection and storage of patient care devices.

PUBLICATIONS

Provisional Patent filed: 11/15/2015

Provisional App Serial Number (SN):
62/218,836

Watkins, Al, Dees, Danelle, and Butler, Tabitha. "Measurement of O-phthaldehyde (OPA) by High Pressure Liquid Chromatography (HPLC) with Post Column Derivatization." TechConnect World Innovation Conference & Expo, June 15, 2015, Washington DC.

Watkins, Al, Dees, Danelle, and Butler, Tabitha. "Accurate Measurement of OP Concentration for Disinfection Application.", NOBIC (New Orleans BioInnovation Center) Technology Showcase, Innovation Louisiana 2015 Conference, November, 18, 2015, New Orleans, LA.

National Aeronautics and Space Administration

Duane Armstrong

Stennis Space Center

EA42/Advanced Technology and Technology Transfer
Branch
Stennis Space Center, MS 39529
228-688-1929
SSC-Technology@nasa.gov

<http://technology.nasa.gov/>

www.nasa.gov

NP-2016-02-2132-HQ

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

SSC-00448

