

HUMAN SPACE ENDEAVOURS SYMPOSIUM (B3)
New Technologies, Processes and Operating Modes Enabling Future Human Missions (7)

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PRESENTING A SINGLE MULTIFUNCTIONAL SENSOR-ON-A-VALVE ANALYZER DEVELOPED
FOR MONITORING DRINKING WATER DISINFECTANTS USED ON THE INTERNATIONAL
SPACE STATION

Abstract

A single laboratory-built multifunctional flow injection unit has been designed to monitor, during spaceflight, both types of disinfectants used on the International Space Station—ionic silver and iodine. Two relatively simple yet separate spectrophotometric chemistries have been optimized for detection of each disinfectant on this single analyzer and are discussed. Configuration from ionic silver to iodine was achieved simply by replacement of working reagents on the manifold—a process that can be electronically controlled. This sensor is unique to alternative devices for monitoring both ionic silver and iodine separately in that it has electronically controlled processes throughout each analysis. Incorporation of "sensor-on-a-valve" technologies allows for fully automated processes and highly reproducible analysis which minimizes hands-on operation by mission specialists. Results from method detection limit (MDL), accuracy and precision studies for both ionic silver and iodine are discussed in detail. Under optimized experimental conditions, spiked water samples were analyzed to evaluate recoveries. This device has been expanded terrestrially to monitor free available chlorine (disinfecting species) in drinking water in United States distribution systems. MDL, accuracy and precision estimates are also reported and show good agreement with an alternative method. Versatility shown by the detection of chemically diverse species with one manifold shows potential to explore other chemistries for monitoring other regulated analytes during spaceflight using this single flow injection device. Providing the ISS with a single fully automated flow injection device capable of monitoring multiple analytes will allocate crew members' valued time to more pertinent in-flight missions and not day-to-day operations.