2014 ISS Potable Water Characterization and Continuation of the DMSD Chronicle

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ABSTRACT

During 2014 the crews from Expeditions 38-41 were resident on the International Space Station (ISS). In addition to the U.S. potable water reclaimed from humidity condensate and urine, the other water supplies available for their use were Russian potable water reclaimed from condensate and Russian ground-supplied potable water. Beginning in June of 2014, and for the fourth time since 2010, the product water from the U.S. Water Processor Assembly (WPA) experienced a rise in the total organic carbon (TOC) level due to organic contaminants breaking through the water treatment process. Results from ground analyses of ISS archival water samples returned on Soyuz 38 confirmed that dimethylsilanediol (DMSD) was once again the contaminant responsible for the rise. With this confirmation in hand and based upon the low toxicity of DMSD, a waiver was approved to allow the crew to continue to consume the water after the TOC level exceeded the U.S. Segment limit of 3 mg/L. Several weeks after the WPA multifiltration beds were replaced, as anticipated based upon experience from previous rises, the TOC levels returned to below the method detection limit of the onboard TOC analyzer (TOCA). This paper presents and discusses the chemical analysis results for the ISS archival potable water samples returned in 2014 and analyzed by the Johnson Space Center's Toxicology and Environmental Chemistry laboratory. These results showed compliance with ISS potable water quality standards and indicated that the potable water supplies were acceptable for crew consumption. Although DMSD levels were at times elevated they remained well below the 35 mg/L health limit, so continued consumption of the U.S potable water was considered a low risk to crew health and safety. Excellent agreement between inflight and archival sample TOC data confirmed that the TOCA performed optimally and it continued to serve as a vital tool for monitoring organic breakthrough and planning remediation action.

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