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Interactive Presentations - 28th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (IP)

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WOLFSAT-3: A REVOLUTIONARY ASPECT OF SUSTAINING LIFE IN THE SPACE ENVIRONMENT

Abstract

Sustaining life in space for long periods of time by having access to clean water, at an inexpensive cost, is a topic of high priority, and a solution to this dilemma would advance space exploration, colonization, and change the world for the better. Common metal contaminants, such as iron, chromium, and lead, leak into water sources, thus contaminating the water.

Additionally, several technologies have been created to provide a solution to this detrimental problem, however, the proposed solutions require prodigious amounts of energy, chemical additives, and are very expensive. However, a revolutionary method of utilizing certain bacteria, known as Geobacter metallireducens, can provide an inexpensive and energy-efficient way to provide access to clean water in space. Geobacter metallireducens are a type of bacteria that utilize electrical energy to breathe and survive in their environment. The organisms oxidize monoaromatic compounds, alcohols, and several short-chain fatty acids with iron (III) oxide. The organisms can also utilize other metals such as uranium for energy and can convert Uranium (VI) to Uranium (IV). Geobacter metallireducens also consume some radioactive elements, such as uranium, and consume the contaminants. The organisms change metals from a soluble to an insoluble form. The insoluble metal isn't in the groundwater, thus decontaminating water sources. In addition to producing the insoluble form of the metal, the organism also produces voltage as a byproduct, which can be beneficial in developing microbial fuel cells, which act as a source of power.

An example of a CubeSat utilizing the Geobacter metallireducens would be the WolfSat-3. The WolfSat-3 is a biological mission that aims to accurately measure and record the amount of voltage produced by the Geobacter metallireducens in the space environment to enhance the availability and cost-effectiveness of decontaminating water in space. Though its secondary mission is a technology demonstration, the WolfSat-3's primary mission is education. The WolfSat-3 was developed by a high school student from The Wolfpack CubeSat Development Team (WCDT) in south Florida. The WolfSat-3 will bring students from different schools, states, and backgrounds, to provide them with not only an education on the life cycle of a satellite mission, but to ameliorate today's space travel and exploration.