

Renewable Long Life Biocidal Hydrophilic Coating for Condensing Heat Exchangers

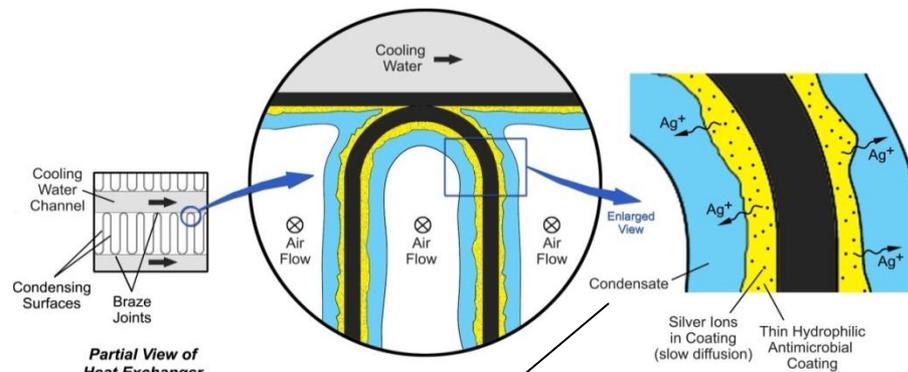
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Identification and Significance of the Innovation

- Condensing heat exchanger (CHX) for ECLSS
 - Creare has developed an adherent, hydrophilic, biocidal coating
 - The coating needs improvements to extend lifetime
- Innovation: Coating and cleaning system to extend lifetime
 - Improved coating chemistry resists dissolution and maintains biocidal properties for long life
 - Zero-gravity, mass-efficient, in situ cleaning process to remove contamination and restore hydrophilic properties
- Phase I Results
 - Deposited thicker coatings to extend lifetime
 - Molecular dynamic simulations show potential for longer life
 - Tests of improved coating chemistry demonstrate low diffusion and promise longer life. Overall 2 to 8 years possible.
 - Demonstrated an effective cleaning process that is compatible with a manned spacecraft environment
- TRL 3 at start of Phase II, TRL 5 at end of Phase II

Coating Concept



Condensed Liquid:

- During Operation – Crew Condensate
- During Cleaning – Cleaning/Rinsing Solutions

Phase II Technical Objectives and Work Plan

- Goal: Improve long-term CHX reliability
- Technical objectives for extended coating service life
 - Hydrophilic, antimicrobial, long-life coatings (2+ years)
 - In situ cleaning system to restore wetting properties
- Phase II work plan
 - Optimize final coating process
 - Molecular dynamics modeling of coating degradation process
 - Develop in situ coating cleaning system
 - Produce coated samples and CHX core sections
 - Coating performance and life tests (small coupons)
 - Life and cleaning tests of a coated CHX core section

NASA and Non-NASA Applications

- NASA Applications/Manned Space Exploration
 - ECLSS for manned lunar and/or planetary bases
 - ECLSS for future manned spacecraft
 - Space Station upgrades to replace or clean existing condensing heat exchanger
- Non-NASA applications
 - Water management for fuel cell power systems
 - Hydrophilic coatings for any condensing heat exchanger
 - Biocidal coatings for any water heat transfer surface
 - Coatings for compact heat exchanger/reactors

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