

## Effects of Material Choice on Biocide Loss in Orion Water Storage Tanks

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When preparing for long-duration spaceflight missions, maintaining a safe supply of potable water is of the utmost importance. One major aspect of that is ensuring that microbial growth is minimized. Historically, this challenge has been addressed through the use of biocides. When using biocides, the choice of materials for the storage containers is important, because surface reactions can reduce biocide concentrations below their effective range. In the water storage system baselined for the Orion vehicle, the primary wetted materials are stainless steel (316 L) and a titanium alloy (Ti6Al4V). Previous testing with these materials has shown that the biocide selected for use in the system (ionic silver) will plate out rapidly upon initial wetting of the system. One potential approach for maintaining an adequate biocide concentration is to spike the water supply with high levels of biocide in an attempt to passivate the surface. To evaluate this hypothesis, samples of the wetted materials were tested individually and together to determine the relative loss of biocide under representative surface area-to-volume ratios after 24 hours. Additionally, we have analyzed the efficacy of disinfecting a system containing these materials by measuring reductions in bacterial counts in the same test conditions. Preliminary results indicate that the use of titanium, either individually or in combination with stainless steel, can result in over 95% loss of biocide, while less than 5% is lost when using stainless steel. In bacterial testing, viable organisms were recovered from samples exposed to the titanium coupons after 24 hours. By comparison, no organisms were recovered from the test vessels containing only stainless steel. These results indicate that titanium, while possessing some favorable attributes, may pose additional challenges when used in water storage tanks with ionic silver biocide.