

## Abstract for ICES Conference 2016

Title: Investigation of desiccants and CO<sub>2</sub> sorbents for advanced exploration systems 2015-2016.

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Design of advanced carbon dioxide removal systems begins with the study of sorbents. Specifically, new CO<sub>2</sub> sorbents and desiccants need to be studied to enable greater productivity from existing and future spaceflight systems. This presentation will discuss the studies used as input for selecting future CO<sub>2</sub> sorbent materials. Also, the adjoining issues of understanding the effects of water co-adsorption and material selection for desiccant beds will be discussed.

Current sorbents for CO<sub>2</sub> removal are based on 5A zeolites, but a transition to sorbents derived from 13X will be necessary as CO<sub>2</sub> levels in cabin air become leaner. Unfortunately, these 13X zeolites are more susceptible to long-term performance loss due to water co-adsorption than 5A due at achievable regeneration temperatures. A study on how impactful the presence of trace water will be to the cyclic operation of small-scale beds will be discussed. Also, methods to recover the performance of beds in a space environment after a major moisture adsorption event will be discussed. The information obtained from the water co-adsorption studies will play a major part in selecting a CO<sub>2</sub> sorbent for advanced removal systems.

Pellet structural properties play another major role in the selection process. One factor for long-term, hands-off operation of a system is pellet integrity. Maintaining integrity means preventing pellet fracture and the generation of fines due to various thermal and mechanical means which would eventually clog filters or damage downstream systems. Either of these problems require significant shutdowns and maintenance operations and must be avoided. Therefore, study of high-integrity pellets and design of new pellets will be discussed.