Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

The Dynamics of Liquid Sorbents in Open Capillary Channels[1]
SAMUEL MOHLER, MARK WEISLOGEL, Portland State Univeristy, NASA COLLABORATION — Direct contact liquid-gas sorbent beds offer unique benefits for spacecraft air quality control. In a recent ISS technology demonstration experiment (CSELS—Capillary Sorbent), two 16-parallel open capillary channel contactors plumbed in series demonstrated passive 'thin film' control, modeling both absorption and desorption functions for a potential low-gravity gas scrubbing system for spacecraft. The open wedge-shaped channels mimic terrestrial falling film reactors by exploiting capillary pressure gradients instead of gravity. In this presentation we highlight the fluid mechanics of the process with and without the effects of CO_2 absorption across the surface. We identify the limits of operation, stability, and transients for systems as functions of wedge geometry and working fluid thermo-physical properties. Rare analytical solutions are found that may be applied to enormous systems of n-parallel channels. The analytical approach serves as the building block for massively parallel systems requiring large surface areas to achieve the desired performance

[1]NASA Cooperative Agreement 80NSSC18K0161, CoTR: J. McQuillen, NASA GRC

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Date submitted: 02 Aug 2019 Electronic form version 1.4