An Approach to Modeling Vacuum Desorption

C. F. Gomez[1], R. Schunk[1], R. F. Coker[1], J. Knox[1]

[1]NASA Marshall Space Flight Center, Huntsville, AL, USA

Abstract

The objective of this simulation effort is to develop a mathematical model of vacuum desorption on a POC (Proof of Concept) canister loaded with Zeolite 13X/5A . This canister contains a pelletized adsorption bed which is used to adsorb H2O and CO2. Once this bed is fully saturated with an equilibrium loading, desorption is then accomplished by reducing the pressure to near vacuum. This type of simulation will help establish predictive capabilities that can be correlated with subscale testing and ultimately be used to maintain both crewed spacecraft cabin humidity and carbon dioxide levels within acceptable limits. New and/or different physics must be included to account for multi-species adsorption/desorption. The POC canister is modeled with a one dimensional discretization in COMSOL Multiphysics® software utilizing 4 separate interfaces: Transport of Concentrated Species (Conservation of Mass), Heat Transfer (Conservation of Energy), General Form PDE (Continuity and Momentum),and a multi-component adsorption physics (Toth equation) represented by a General Form PDE and through internal variables and symbols.