Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Tandem Gravimetric and Volumetric Apparatus for Methane Sorption Measurements JACOB BURRESS, DONALD BETHEA, University of South Alabama — Concerns about global climate change have driven the search for alternative fuels. Natural gas (NG, methane) is a cleaner fuel than gasoline and abundantly available due to hydraulic fracturing. One hurdle to the adoption of NG vehicles is the bulky cylindrical storage vessels needed to store the NG at high pressures (3600 psi, 250 bar). The adsorption of methane in microporous materials can store large amounts of methane at low enough pressures for the allowance of conformable, "flat" pressure vessels. The measurement of the amount of gas stored in sorbent materials is typically done by measuring pressure differences (volumetric, manometric) or masses (gravimetric). Volumetric instruments of the Sievert type have uncertainties that compound with each additional measurement. Therefore, the highest-pressure measurement has the largest uncertainty. Gravimetric instruments don't have that drawback, but can have issues with buoyancy corrections. An instrument will be presented with which methane adsorption measurements can be performed using both volumetric and gravimetric methods in tandem. The gravimetric method presented has no buoyancy corrections and low uncertainty. Therefore, the gravimetric measurements can be performed throughout an entire isotherm or just at the extrema to verify the results from the volumetric measurements. Results from methane sorption measurements on an activated carbon (MSC-30) and a metal-organic framework (Cu-BTC, HKUST-1, MOF-199) will be shown. New recommendations for calculations of gas uptake and uncertainty measurements will be discussed.

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Date submitted: 10 Nov 2016 Electronic form version 1.4