

Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Measurement of 18650 format lithium ion battery vent mechanism flow parameters¹ FRANK AUSTIN MIER, MICHAEL HARGATHER, New Mexico Tech, SUMMER FERREIRA, Sandia National Laboratories — Under abuse conditions, decomposition reactions within a lithium-ion battery can lead to gas generation resulting in an internal pressure increase. To mitigate the risk of case rupture, commercially available lithium batteries generally contain a pressure relief vent. However, the process of cell venting still presents risks associated with the flow of flammable gases and liquid electrolyte. To better understand this flow, tests are performed on vent mechanisms from the commonly available 18650 format of lithium-ion battery. Experimentally determined flow parameters include opening pressure, effective area, and coefficient of discharge. The batteries tested have a vent mechanism located on the cells positive terminal which presents a unique geometry. A test fixture was designed and constructed to pressurize the vent mechanism from a disassembled battery to the point of opening, at which point the opening pressure is recorded. Measurements of stagnation pressure within an accumulator and static pressure in a known cross-sectional area are used to solve for the opening area of the vent with compressible-isentropic flow relationships. An additional measurement of stagnation temperature allows for calculation of mass flow rate out of the system and thus coefficient of discharge.

¹This work was funded by the US DOE OE's Energy Storage Program under contract SAND2017-8019 A.

Michael Hargather
New Mexico Tech

Date submitted: 31 Jul 2017

Electronic form version 1.4