

SPACE PROPULSION SYMPOSIUM (C4)
Propulsion Technology (2) (5)

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CRYOGENIC PVT-X MEASUREMENTS OF HELIUM-HYDROGEN MIXTURES

Abstract

Helium remains an important pressurant for liquid hydrogen fuel tanks. Precise mixture measurements of this highly quantum mixture are necessary for predictive models for propellant slosh and transfer. This work provides a review of cryogenic helium-hydrogen mixture measurements and presents Pressure-Volume-Temperature-Composition (PVT-x) measurements taken with a Rubotherm IsoSORP 2000 dual-sinker magnetic suspension microbalance that has been retrofitted for cryogenic service. This system has been validated by direct comparison to previously published experimental data and extends the range of helium-hydrogen density measurements. The range of possible measurements extends from 10 K to 288 K for pressures up to 275 bar. Plans for future testing of mixture and sorbents important to cryogenic stages are presented.