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C3Po1C-09: Modeling of thermal performance in self-pressurized liquid helium tanks

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A thermal multi-zone model is used to describe the self-pressurization process in a liquid helium storage tank. This model divides the liquid and ullage of the tank into multiple zones taking into account the effects of the boundary layer in each zone. Combined with helium property parameters from REFPROP, the model can calculate the self-pressurization process of a liquid helium storage tank under various filling rates and heat leaks. The validity is verified by comparing its results with existing liquid helium storage tank experiments. Finally, the self-pressurization process of liquid helium storage tanks with different filling rates and heat leaks is simulated to obtain the pressurization curves of liquid helium storage tanks and the temperature and thermal stratification effects. The simulation results are further compared to identify the reasons contributing to the pressurization of liquid helium storage tanks.

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