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#### **ACCEPTED MANUSCRIPT**

## Thermal physical performance in liquid hydrogen tank

### under constant wall temperature

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### Abstract:

A calculation model is developed to investigate the pressurization performance and thermal stratification in liquid hydrogen (LH<sub>2</sub>) tank. Viscous flow is considered in the stratification model to ensure the continuity of fluid flow and heat exchange. The tank pressure rise, energy distribution and thermal stratification are studied respectively. Compared to the results without considering the phase change, the tank pressure, the stratified layer temperature and the ullage temperature calculated with phase change considered, have increased about 69.98%, 70.90% and 15.53%. Moreover, influences of gravity level, initial wall temperature and initial liquid height on the development of thermal stratification are analyzed. It turns out that the larger the gravity level is, the faster the liquid thermal stratification develops. The effect of initial wall temperature on the growth of thermal stratification is the same. Both the ullage pressure and the stratified temperature increase with time. While the gravity level is larger than a certain value and the initial wall temperature is less than a certain value, the ullage pressure and the stratified temperature decrease firstly, and then increase. Meanwhile,

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