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THE LH₂/LOX CRYOGENIC PROPULSION TECHNOLOGY FOR FUTURE DEEP SPACE
EXPLORATION

Abstract

The scale of future deep space exploration mission will become larger and larger, the propulsion system always is one of the core technologies which limits the development of deep space exploration. The current propulsion system using storable propellants has low performance, while some new high performance propulsion systems including nuclear and electric have low TRL(Technology Readiness Level) or low thrust. LH₂/LOX cryogenic propulsion technology has advantages with high performance, high thrust and high TRL, which applied in orbit transportation will boost the development of deep space exploration, especially for the lunar exploration missions, whereas cryogenic propulsion used on orbit faces many technical difficulties, such as the cryogenic propellant boiling-off control. In this paper, the state-of-art and development on the space cryogenic propulsion technology in the world are summarized at first. And then some related key technologies are analyzed. These key technologies not only can be applied in LH₂/LOX propulsion system, also can be applied in nuclear thermal propulsion system in future. At last, a design scheme of LH₂/LOX common orbit transfer stage and the solutions of key technologies are given, the key technologies include cryogenic propellant on-orbit storage and management, low thermal conduction connection-support structure, integrated vehicle fluid system, advanced cryogenic rocket engine, and system design and optimization.