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THE FLOW CHARACTERISTICS STUDY OF FLOATING RING SEAL OF LIQUID ROCKET ENGINE

Abstract

This paper introduces the basic theory and structural features of floating ring seal, the influence of eccentricity on film thickness and film pressure distribution is studied. According to the characteristics of liquid rocket engine seal, the flow characteristics of 3 kinds of floating ring structures are calculated and analyzed, such as common floating ring, labyrinth floating ring and fluid dynamic pressure floating ring. The results show that: the pressure downward trend of the labyrinth floating ring is consistent with the common floating ring, but, when the gas flows through the labyrinth channel, there is a low pressure vortex in the flow field, and the leakage rate of the labyrinth floating ring decreases significantly under the equal enthalpy thermodynamics. In order to analyze the influence of the structure of the fluid dynamic pressure floating ring, the dynamic characteristics and sealing performance of the floating ring with different groove depth are analyzed, the results show that: when R=0.3mm, the buoyancy of the floating ring is the largest, and with the increase of R, the buoyancy decreases gradually; when R=0.6mm, the buoyancy is negative, which is that the floating ring loses the ability to float; when R=0.3mm, the leakage of floating ring is minimum; when R reaches 0.5mm, the leakage rate tends to be stable. In summarycompared with the common floating ring's leakage rate and fluid velocity, the labyrinth floating ring and the hydrodynamic pressure floating ring are improved obviously, the leakage rate is reduced by about 19.1% and 52.7% compared with the existing floating ring. The test results show that the simulation results are accurate and feasible.