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预爆管式脉冲爆震原型机试验研究

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Experimental Investigation on PDE Prototype with Initiator

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摘要

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摘要 为了实现多循环吸气式脉冲爆震发动机(PDE)在较短距离内缓燃向爆震的转捩,降低主爆管通过障碍物触发爆震的内部阻力损失,设计了预爆管和主爆管以同种混气(汽油/空气)为工作介质的两相PDE原型机,试验研究了爆震燃烧过程。研究表明:当预爆管出口扩张角度为45°时,可以实现爆震波在主爆管内向衍射面上、下游传播;设计的预爆管式PDE原型机可以实现最高频率为66.7 Hz的稳定间歇工作。

关键词: 航空航天推进系统 脉冲爆震发动机 爆震 预爆器 缓燃向爆震转捩

Abstract: In order to achieve successful transition from deflagration to detonation within a short distance in the combustor of a multi cycle pulse detonation engine (PDE), and decrease the losses of flow and thrust which come from obstacle setting in the combustor, a prototype two phase PDE is designed which is filled with the same fuel/air mixture in the main combustor and initiator, and the process of detonation and combustion is studied. The results show that when the initiator has a 45° divergent nozzle, detonation waves can propagate from the interface both upstream and downstream in the main combustor. The designed model can operate stably and periodically, and the maximal frequency is 66.7 Hz.

Keywords: aerospace propulsion system pulse detonation engine detonation pre detonator deflagration to detonation transition

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