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INFLUENCE OF RETRACTIVE LENGTH OF COAXIAL INJECTOR ON HIGH-FREQUENCY COMBUSTION INSTABILITY FOR STAGED COMBUSTION LOX/KEROSENE ROCKET ENGINE

Abstract

High-frequency combustion instabilities in staged combustion LOX/kerosene rocket engines are experimentally investigated in two model scale research facilities,and the influence of retractive length of coaxial injector on high-frequency combustion instability is mainly performed. The kerosene combustion and flame in optically accessible square cross-section model chamber which operates at supercritical condition is observed with intensified and high-speed cameras. Coaxial swirl injector elements with different retractive lengths are used to inject liquid kerosene and mixture of air and GO2. The flame images showed kerosene supercritical flame performed like a round jet stream. The flame length decreases with the increase of retractive lengths and flame streams periodically break off as retractive ratio equalls 1.62. Retractive ratio has an optimal range(Range1) to high combustion efficiency and combustion stability.In addition, retractive lengths and operating conditions of the injectors are determined with the single-injector firing modeling experimental system. The gaseous propellant components were used to provide actual volumentric flow rates at low pressure, which is practically equal to atmospheric pressure. The results show that The squeal appear when pressure oscillations with large amplitude are generated.The retractive length of injector has crucial effect on the combustion instability boundary, and have a optimal range which accords with Range1.