邓洋波,孙海涛,王玉龙,严春吉.氢燃料先进旋涡燃烧室流动和燃烧特性[J].航空动力学报,2013,28(1):120~128

氢燃料先进旋涡燃烧室流动和燃烧特性

Flow and combustion characteristics of advanced vortex combustor with hydrogen fuel

投稿时间： 2012-02-23

DOI：

中文关键词： 先进旋涡燃烧室(AVC) 整体煤气化联合循环(IGCC) 流动特性 燃烧 前钝体 后钝体

英文关键词:advanced vortex combustor(AVC) integrated gasification combiend cycle (IGCC) flow characteristic combustion fore-body after-body

基金项目:国家自然科学基金(51076020)

作者	单位
邓洋波	大连海事大学 轮机工程学院,辽宁 大连 116026
孙海涛	大连海事大学 轮机工程学院,辽宁 大连 116026
王玉龙	大连海事大学 轮机工程学院,辽宁 大连 116026
严春吉	大连海事大学 轮机工程学院,辽宁 大连 116026

中文摘要:

为了对整体煤气化联合循环(IGCC)燃气轮机的氢燃料先进旋涡燃烧室(advanced vortex combustor,AVC)结构设计提供理论依据,应用实验和数值模拟相结合的方法对AVC气流流动特性受燃烧室几何参数影响规律进行研究,在此基础上,确定氢燃料AVC内前、后钝体合理的布置方式.应用19步氢气和空气详细化学反应机制,对氢燃料AVC流动和燃烧特性进行数值模拟研究,结果显示:氢气和空气预混和气体主气流当量比为0.65时,在前、后钝体之间形成的凹腔内无喷射气流条件下,燃氢AVC能够形成稳定燃烧,出口温度被控制在1950K以下,总压损失系数为2.7665%,燃烧效率为99.54%.相对于凹腔内无喷射气流,凹腔内有喷射气流的AVC旋涡在*z*轴方向分层有序、结构更加稳定,但不同*xy*截面上温度分布不同,导致出口截面温度分布不均匀,总压损失系数略有增大,燃烧效率提高了.

英文摘要:

To provide a valuable theory basis for the structure design of the advanced vortex combustor (AVC) of the turbine in integrated gasification combined cycle (IGCC),experiment and numerical simulation were conducted to study the flow characteristics of the AVC under cold flow condition.On this basis,the reasonable arrangement of fore-body and after-body in the AVC with hydrogen fuel was attained.Using 19-step chemical reaction mechanism,a numerical simulation was conducted to study the flow and combustion characteristics of AVC with hydrogen fuel.The results show that the combustion can be steadily maintained,and the temperature at the outlet can be controlled below 1950K with the equivalence ratio of hydrogen and air being kept at 0.65 without gas injected into the cavity between fore-body and after-body.At the same time,there are total pressure loss coefficient of 2.7665% and combustion efficiency of 99.54%.Contrasting to the AVC without gas injected into the cavity,the AVC with flow injected has more regular and steadier vortex configuration,higher combustion efficiency,higher total pressure loss coefficient,and uneven temperature distribution at the outlet.