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贫油预混预蒸发低污染燃烧室头部流场研究

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Flow Field Study for Head of Lean Premixed Prevaporized Low-emission Combustor

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摘要

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摘要 通过数值与试验相结合的方法对一种带有多点燃油直接喷射/双环预混旋流(TAPS/MLDI)燃烧室头部的贫油预混预蒸发(LPP)低污染燃烧室冷态流场进行研究。采用粒子图像测速仪(PIV)试验研究不同火焰筒头部结构参数(值班级旋流器叶片安装角)对LPP低污染燃烧室气流结构的影响。同时利用FLUENT软件对该低污染燃烧室进行数值模拟,所得的计算结果与试验数据比较吻合,表明所研究的LPP低污染燃烧室头部都存在中心回流区(PRZ)、角落回流区(CRZ)以及唇口回流区(LRZ),而且随着值班级旋流器旋流角度的增大,所得的中心回流区径向与轴向尺寸也相应增加。

关键词: 多点燃油直接喷射/双环预混旋流 贫油预混预蒸发 流场 粒子图像测速仪 数值模拟

Abstract: The cold flow fields of a lean premixed prevaporized (LPP) low-emission combustor are studied by numerical simulation and experimental measurement. The LPP combustor is based on a multipoint lean direct injection (MLDI) and twin annular premixed swirler (TAPS). The influence of different pilot swirler angles on the cold flow field of the LPP combustor are measured by using particle image velocimetry (PIV). Different crosswise sections and lengthways sections are measured respectively. The cold flow field is also numerically studied by using software FLUENT. The experimental and numerical results are shown to be in good agreement, and the results demonstrate that the LPP combustor has a primary recirculation zone (PRZ), a corner recirculation zone (CRZ) and a lip recirculation zone (LRZ). Moreover, the radial and axial sizes of the primary recirculation zone enlarge with the increase of the pilot swirler angle.

Keywords: multipoint lean direct injection twin annular premixed swirler lean premixed prevaporized flow fields particle image velocimetry numerical simulation

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