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不同压力下微秒脉冲表面介质阻挡放电流场实验

Experiment of airflow induced by microsecond pulse surface dielectric barrier discharge under pressure influences

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中文关键词： 表面介质阻挡放电（SDBD） 等离子体 诱导涡 压力 粒子图像测速（PIV）

英文关键词:surface dielectric barrier discharge (SDBD) plasma induced vortex pressure particle image velocimetry (PIV)

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中文摘要：

采用粒子图像测速（PIV）技术，在不同空气压力条件下，测量了微秒脉冲等离子体气动激励诱导流场的演化过程，分析了不同压力下的流场启动涡、流场结构和壁面射流.根据实验数据计算研究了诱导力随压力变化的空间分布趋势.实验结果表明：常压下和5500Pa压力下产生一个启动涡，19000Pa和11700Pa压力下产生两个启动涡.稳定流场结构随压力减少分别为L型、∽型和V型.压力减小，诱导流场对等离子体气动激励的响应时间减少，射流切向距离变短，距壁面法向距离增加.最大诱导力随压力降低减小，x坐标逐渐向表面介质阻挡放电（SDBD）激励器靠近.

英文摘要：

Particle image velocimetry (PIV) technology was applied to obtain the evolution of the flow field induced by microsecond pulse plasma aerodynamic actuation, while the starting vortex, flow filed and wall jet were analyzed at different air pressures. Thrust created by the actuator was calculated and analyzed based on the experimental data. Experiment results showed that one starting vortex was found at the ground pressure and the pressure of 5500Pa, while two starting vortices were found at the pressure of 19000Pa and 11700Pa. The steady configuration of the flow field was complex, and evolved towards L, ∽ and V structure as the pressure decreased. The reaction time of the flow field and the tangential distance of the wall jet induced by plasma aerodynamic actuation decreased as the pressure decreased, while the normal distance of the wall jet increased. The maximum thrust also decreased as the pressure decreased, and its x coordinate became closer to the actuator.

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