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# 脉冲爆轰发动机中等离子体点火的数值计算

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# NUMERICAL CALCULATION OF PLASMA IGNITION ON PULSE DETONATION ENGINE

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摘要 该文采用CE/SE方法对脉冲爆轰发动机(简称PDE)中等离子体射流点火和带化学反应的汽油/空气两相爆轰过程进行数值模拟。研究了不同的等离子体射流能量和射流时间对爆轰过程的影响。结果表明增加等离子体射流能量可以缩短燃烧转爆轰的时间和距离;在已经充分点燃射流处汽油/空气混合物的条件下继续增加射流时间对燃烧转爆轰过程几乎没有影响。计算结果与试验结果符合良好。研究工作可为PDE 点火结构的优化设计提供理论指导。

关键词: 脉冲爆轰发动机 等离子体射流 点火 CE/SE方法 两相 爆轰波

Abstract: Numerical simulations of a plasma jet ignition process and a gasoline/air two-phase detonation process considering chemical reaction mechanism in a pulse detonation engine are carried out by the method of conservation element and solution element (CE/SE). The effects of different plasma jet energy and jet time on the detonation process are discussed. The results show that the deflagration to detonation transition (DDT) time and DDT distance can be shortened by increasing plasma jet energy. When gasoline/air mixture was fully lit in jet areas, plasma jet time does not affect the DDT process. The calculation results are in good agreement with experimental ones. The research work provides a theoretical guidance for the optimal design of PDE ignition structures.

Key words: pulse detonation engine plasma jet ignition CE/SE method two-phase detonation wave

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