## 论文资料

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专　　题：燃料特性与化学反应机理

中文标题：超声速气流中气态/裂解态煤油点火过程数值研究

英文标题：Numerical Study of Ignition Process of Gaseous and Cracked Kerosene in a Supersonic Crossflow with a

中文摘要：本文采用由CARM生成的煤油18组分14步反应简化机理对二维超声速气流中气态、部分裂解煤油的横向喷射、氢引点火过程进行了非定常数值模拟。本文首先研究了气态、部分裂解煤油的点火延迟特性，发现煤油裂解产生的小分子碳氢化合物和氢气将有助于缩短点火延迟时间。同时数值研究了马赫数2.5、总温1700K来流中，在氢引条件下气态、裂解态煤油的点火燃烧过程。数值方法采用了SST 湍流模型、涡耗散概念(EDC)燃烧模型以及ISAT积分算法等技术。计算结果发现：煤油燃烧的中间活性产物如CH3、C2H2主要分布在凹腔内，OH分布在凹腔后缘以及下游区域。煤油火焰分布与氢气火焰有很大不同，相比于氢火焰，煤油的火焰主要分布在凹腔后缘及下游。另外，气态煤油的点火比裂解态煤油要缓慢。同一时刻两者产生的CH3浓度、生成速率分布以及正十烷的消耗率分布均存在明显差异。

英文摘要：Obtained with Computer Assisted Reduction Mechanism Code (CARM), a reduced kinetic model including 18 species and 14 reactions was used for an unsteady simulation of ignition process of gaseous and partially cracked kerosene in a supersonic crossflow. The SST turbulence model and the eddy dissipation concept (EDC) model for turbulence/combustion interaction were applied as well as ISAT integral technique for acceleration of numerical integration. The change of ignition delay time as a function of temperature for gaseous and partially cracked kerosene was studied first and the result shows that small hydrocarbon molecules and hydrogen generated by cracking can reduce the ignition delay time significantly. At the same time, numerical simulation of ignition of gaseous and cracked kerosene at a cross flow at a Mach number of 2.5 and a total temperature of 1700K was conducted. It was found the major radicals such as CH3 and C2H2 are located in the cavity and OH is generated in the trailing edge of the cavity and the adjacent downstream region. The flame pattern of kerosene is obviously different from that of hydrogen and is mainly located at the downstream of the cavity. The ignition of cracked kerosene is found to be faster than gaseous kerosene indicated by comparisons of the concentration and the generation rate of CH3 and the consumption rate of NC10H22 of the two cases.

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