

# 微内燃机点火和燃烧中微尺寸效应的研究(PDF)

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Title: Study on the Micro Size Effect in Ignition and Combustion in Micro Engine

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作者: [任泰安](#) 1; 2; [张长富](#) 1; [蒋庄德](#) 1  
1. 西安交通大学精密工程研究所, 710049, 西安; 2. 河南机电高等专科学校机械工程系, 453002, 新乡

Author(s): [Ren Tai'an](#) 1; 2; [Zhang Changfu](#) 1; [Jiang Zhuangde](#) 1  
1. Institute of Precision Engineering, Xi'an Jiaotong University, Xi'an 710049, China; 2. Department of Mechanical Engineering, Henan Mechanical and Electrical Engineering College, Xinxiang 453002, China

关键词: [微内燃机](#); [点火](#); [燃烧](#); [微尺寸效应](#)

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摘要: 从设计的微小空间燃烧室中, 观察微燃烧通道中氢气/空气预混气体的燃烧现象, 当空间尺寸从厘米级减小到毫米级时, 点火和燃烧的不同特征会导致氢气的着火浓度界限变小, 使得燃烧不稳定、不充分, 极易造成淬熄. 因此, 提出了选用淬熄距离小、反应速度快、最小点火能小的气体作燃料, 采取催化反应、增压和绝缘等措施促进微小空间内的点火和燃烧. 通过分析微小空间对制备微型内燃机内平板电容点火器的限制, 表明采用蒸发工艺制备的电极厚度小, 因此增加电镀工艺, 可使电极厚度达到4  $\mu\text{m}$ , 明显提高了电容的单次放电能量

Abstract: The experimental apparatus of micro space ignition and combustion are designed to investigate the size effects of micro space ignition and combustion by reducing the sizes of the combustors with premixed hydrogen/air. The experimental results in the micro space show that the smaller the ignitable hydrogen concentration range, the shorter the gas fuel residence time. When the sizes of the combustors decrease from centimeter scale down to millimeter scale, the heat transfer loss increases obviously due to the growing of the ratio of surface to volume and the stable combustion is difficult to maintain due to flame quenching. It is suggested to adopt hydrogen possessing low quenching distance and ignition energy associated with pressure, insulation and catalysts. The plate capacitor spark electrodes for micro space combustion with cantilever beam structures are designed and fabricated by evaporation, where the gap between two spark electrodes gets more than 10  $\mu\text{m}$  and the thickness less than 0.2  $\mu\text{m}$ . Smaller capacitance of the electrode leads to a longer igniting time. Electroplating is proposed after evaporation to deposit in relatively large volumes for microfabrication, thus 4  $\mu\text{m}$  thickness of the electrode is obtained

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