

杨振中,Hailin Li.2004 Mack MD11柴油机燃料加氢后NOx与微粒排放特性[J].农业工程学报,2012,28(12):62-67

2004 Mack MD11柴油机燃料加氢后NOx与微粒排放特性

NOx and particulate emission characteristics of 2004 Mack MD11 diesel engine with addition of H₂

投稿时间: 2011-10-29 最后修改时间: 2012-04-17

中文关键词: [氢燃料](#),[柴油机](#),[NOx](#),[排放特性](#),[微粒](#)

英文关键词:[Hydrogen fuels](#) [diesel engines](#) [NOx](#) [emissions](#) [particulate matter](#)

基金项目:国家自然科学基金(51076046);河南省创新型科技人才队伍建设工程(创新型科技团队,2011-39)、郑州市科技创新人才专项(096SYJH25086)和河南省重点科技计划项目(102102210034)资助。

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摘要点击次数: 173

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中文摘要:

为了降低柴油机的排放,氢作为柴油机燃料的研究正在引起研究者的关注。该文进行了在2004 Mack MD11柴油机中添加不同比例氢气(最高氢气比例达7%)与柴油形成混合燃料的NO_x、微粒(PM, particulate matter)排放特性研究。研究表明:负荷工况不同,添加氢气对NO_x排放特性的影响不同;随着添加氢的增加,有NO转化为NO₂现象;NO_x排放很大程度还与发动机可变截面涡轮增压系统(VGT, variable-geometry gas turbine)和废气再循环系统(EGR, exhaust gas recirculation)工作状态有关;添加氢气后即使在大、全负荷下,NO_x排放量也没有明显增加。这主要归因于2004 Mack MD11采取了EGR,并且随着负荷增加,EGR率也在增加。在各种负荷工况下,添加氢气对降低PM排放量的作用明显,PM排放量减小率一般达50%以上,最高达75%。

英文摘要:

In order to reduce emissions of diesel engines, hydrogen for fuel of heavy-duty diesel engines paid more attention in recent years. Effect of the addition of hydrogen on the emissions of NO_x and PM at different proportion (the highest volume proportion of the hydrogen is 7% of hydrogen air mixture in inlet pipe) into 2004 Mack MD11 diesel engine have been conducted. Research showed that the addition of hydrogen on NO_x emission characteristics had different effects with the increase of hydrogen added in various load. And a change from NO to NO₂ had been found. It was found that emission of NO_x related to the variable-geometry gas turbine (VGT) and exhaust gas recirculation(EGR). And NO_x emission was not significantly increased after adding hydrogen gas even at large or full load operating condition, which was mainly attributed to the EGR of the diesel engine, and the EGR rate was increased as the load increasing. Research also showed that adding hydrogen can reduce PM emission under different load conditions.

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