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甲醇柴油双燃料燃烧结合DOC/POC耦合大幅度减少发动机微粒排放的研究

Significant reduction of PM emission from diesel engines by DMDF combined with DOC+POC

关键词：甲醇/柴油 烟度 微粒 粒径分布 DOC+POC

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摘要：对一台四缸增压中冷柴油机采用甲醇柴油双燃料模式,研究了甲醇替代率和柴油机氧化催化转化器耦合微粒催化转化器(DOC+POC)后处理装置对该发动机烟度和微粒数量、质量浓度的粒径分布特性的影响.试验结果表明,随甲醇替代率的增加,发动机烟度和微粒数浓度、质量浓度均有不同程度的降低,核态微粒浓度显著降低,聚集态微粒浓度基本保持不变.相比于DOC+POC对纯柴油发动机排气烟度25%左右的净化效率,在甲醇柴油双燃料模式下DOC+POC对排气烟度的平均净化效率在60%以上,最大达到96%,显示了该后处理技术在甲醇柴油双燃料模式下清洁排放的良好应用前景.

Abstract: Experiments were conducted on a turbocharged inter-cooled diesel engine modified to diesel/methanol duel fuel (DMDF) mode. The effects of the ratio of methanol substituted for diesel fuel as well as the coupling of diesel oxidation catalyst convertor (DOC) and particulate oxidation catalyst convertor (POC) on smoke opacity, particulate matter (PM) mass and number concentrations and size distribution characteristics were studied on the DMDF engine. The testing results showed that, with the increase of methanol substitution ratio, the engine smoke opacity and particle number and mass concentration, the nucleation mode particle number and mass concentration were significantly reduced, while the accumulation mode particle number and mass concentration basically remained unchanged. The conversion efficiency of DOC+POC of the baseline diesel engine for smoke opacity was only 25%, while that of the engine in the DMDF mode reached 60% with the maximum of 96%. The results illustrated that the technology of the DMDF in combination of DOC+POC could remarkably improve the exhaust emissions to diesel engine for heavy duty vehicles.

Key words: diesel/methanol smoke opacity particulate matter size distribution DOC+POC

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