Studies on engine injection characteristics and deposit formation for biofuel = 生質燃料對引擎噴霧特性與積污特性之研究

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摘 要

研究以生質柴油為主，分析其直噴式引擎噴霧特性與積污特性為主要研究目標，以廢食用油及不可食用的蓖麻油為主要油源來製作生質油，取代玉米甘蔗等糧食作物。毒蓖麻油與廢食用油具有高黏度及含水量，直接當成引擎燃料性能頗差，本研究利用轉酯化與乳化技術，改善油品黏度所引起的噴霧特性劣化情形， 並解決生質油NOX 排放量偏高的現象。同時，生質油經過長期的DI引擎測試過程後，引擎積污情形頗為嚴重，特別是噴嘴處積污導致引擎噴霧與廢氣排放特性劣化情形。因此，為了觀察高溫環境下生質油及其乳化油的特殊噴霧現象，本研究建立一高溫條件下的定容模擬裝置，以便分析其噴霧特性和石化柴油作比較。另外，為了解決生質油積污問題，本研究建立一實驗室尺度的生質油積污生成模擬裝置，以先導篩選出有效的添加劑來解決生質油積污問題。實驗結果顯示：在提高引擎噴射壓力與乳化技術配合下，生質油的噴霧特性有所改善;同時，利用抗氧化劑型添加劑可抑制生質油的積污生成機制，而本生質油噴霧與積污模擬裝置，結果可做為生質油引擎與實車試驗之先導測試依據。最後建議在不改變引擎硬體結構下，可提高5-10% 左右的生質油噴射壓力，添加配方15-20% 左右的乳化含水量， 2-5% 的生質酒精與0.2-0.5% Span-Tween 型的乳化劑，配合2000ppm的抗氧化劑型添加劑下，生質油NOX 排放問題與積污問題可同時獲得改善。

關鍵詞 : 生質柴油、噴霧特性、引擎積污、NOx 排放

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