論文の要旨

題 目 Effects of Piston Cavity Impingement and Split Injection on Mixture Formation and Combustion Processes of Diesel Spray

（ディーゼル噴霧のピストンキャビティ衝突と分割噴射が混合気形成及び燃焼過程に及ぼす影響）

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The objective of this work is to obtain an enhanced understanding of the effect of split injection on mixture formation and combustion processes of diesel spray and 2-D cavity impinging spray. Three kinds of injection amounts (0.27 mg, 0.89 mg, 2.97 mg) were adopted to investigate the effect of small injection amount on the mixture formation and combustion processes of free spray. For the split injection, the injection process comprised a pre-injection followed by the main injection. The main injection was carried out either as a single injection of injection pressure 100 MPa (Pre + S100), 160 MPa (Pre + S160) or split injection of injection pressure 160 MPa itself was either of two types defined by mass fraction ratios 50 : 50 and 75 : 25 (Pre + D160_50-50, Pre + D160_75-25). S100 and D160_75-25 strategies were also compared with Pre + S100 and Pre + D160_75-25 to check the effect of pre-injection on the combustion process under 2-D cavity impinging spray. Low oxygen concentration (15% O2) was investigated in the 2-D cavity under split injection.

Mie scattering method and laser absorption-scattering (LAS) technique were employed to qualitatively and quantitatively characterize the spray development. Tracer LAS fuel with 97.5 vol% of n-tridecane and 2.5 vol% of 1-methylnaphthalene (α-MN) was employed. The characteristics of the combustion process of Diesel spray were investigated by adopting a color camera which directly perceived the flame natural luminosity, OH* chemiluminescence recording system, and two-color perometry techniques.

The experimental results revealed that the vapor distribution of split injection was

significantly more homogeneous than that of single injection. Pre-injection could improve the main injection combustion. The split injection can reduce the soot emissions under free spray flame. Increase the split injection interval should be a positive way to reduce the soot emissions in the 2-D impinging spray flame.