学 位 論 文 概 要

題 目　Effects of Split Injection on Adhered Film Formation of Flat-Wall Impinging Fuel Spray

（平板壁面に衝突する燃料噴霧の液膜形成に及ぼす分割噴射の影響）

氏　名 常飛翔 (CHANG, FEIXIANG)

Due to engine miniaturization and high injection pressure, it is difficult to avoid spray/wall interaction in the direct-injection spark-ignition (DISI) engines, which causes the formation of fuel films. The fuel film on the wall has a negative effect on the combustion process and engine performance. To improve the high combustion efficiency and low emissions, split injection strategy and DISI system are widely applied to gasoline engines due to the pace of technological innovation. The formation of fuel film has an intimate relationship with the microscopic behaviors of fuel droplets after impingement. Therefore, the microscopic characteristics of the impinging spray need to be clearly understood. However, owing to the high droplet density of the spray-dense region, the microscopic characteristics of droplets were hardly detected during the fuel injection period.

Chapter 1 presents a review of previous works on the development of DISI engines, split injection and spray/wall interaction as well as optical diagnostics.

Chapter 2 shows the experimental setup in this work, such as fuel injection system, constant high-pressure chamber, impingement system and introduces the investigation techniques applied in this work.

Chapter 3 investigates the spray characteristics and fuel film evolution of split injection are experimentally under non-evaporation and evaporation conditions.

Chapter 4 depicts and compares the influences of split injection mass ratios on the fuel film, and the effects of ambient temperatures on the spray impingement and fuel film formation are studied.

Chapter 5 observes and compares the microscopic characteristics of the free and impinging sprays under different experimental conditions with the help of spray slicer.

Chapter 6 investigates the droplets behaviors in the near wall region after impingement.

Finally, Chapter 7 summarizes the findings of fuel film and droplet behaviors in this work.