講演番号	131

文献番号	20226131

Study of Soot Formation in Gasoline Direct Injection Engines by Means of Diffuse Back-Illuminated Extinction Imaging

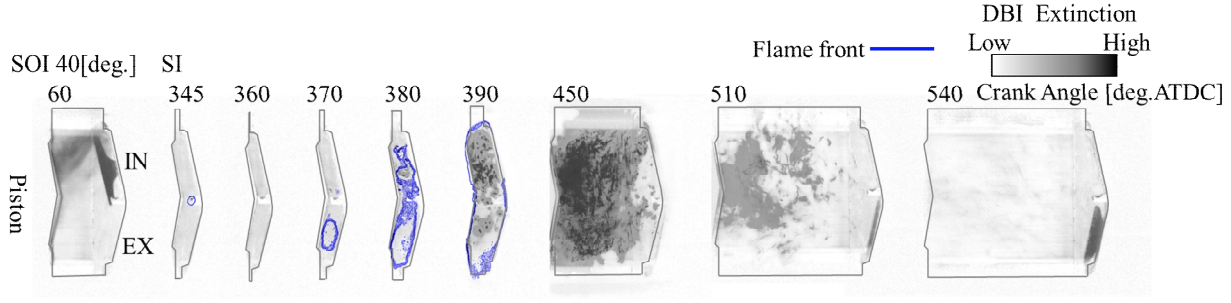
Kato Masaaki [1)] Nakayama Tomohiro [1)] Okada Hiroya [1)] Shiina Yoshirou [1)]

1) SUBARU CORPORATION

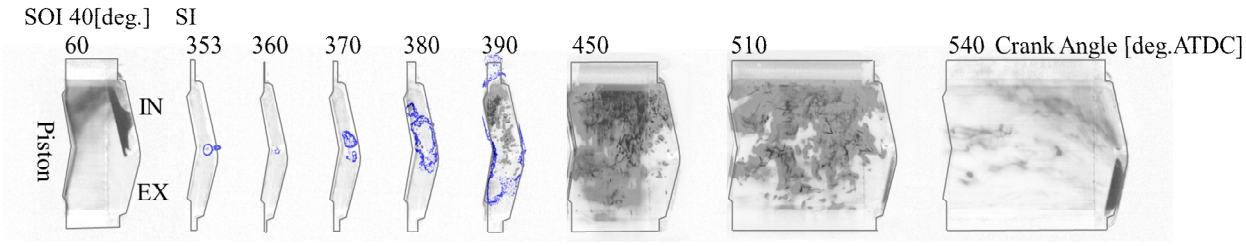
3-9-6 Ohsawa, Mitaka, Tokyo, 181-8577, Japan (E-mail: kato.masaaki@subaru.co.jp)

KEY WORDS: Heat engine, Spark ignition engine, Emissions gas, Particle Matter, DBI [A1]

The diffuse back-illumination extinction imaging method was applied to measure soot formation, accumulation and oxidation processes in an optical access engine with a gasoline direct injection system. The relationships between burned gas temperatures which calculated from the two-zone model and soot extinction images were verified. Fuel wetting areas in a combustion chamber have effects not only amounts of fuel films, but also the exposure timings to the hot burned gas. Fig.1 shows the soot extinction images by means of DBI with different ignition timings. The engine is operated under the same fuel injection controls and almost the same fuel wetting conditions. It is seen that soot particles increase in the expantion stroke under retarded ignition timing conditions. Fig.2 shows the time series temperatures and pressures in a combustion chamber with each ignition timing. Soot generation regions of gasoline surrogate fuels are referred from Tanaka et al. [(1)] in this figure. Ignition timings chang the burned gas temperature and it's staying durations in the soot generation region. The retarded ignition timing makes the duration longer under this engine operating condition. Effects of dilution



(a) Ignittion timing 15deg.BTDC



(b) Ignition timing 7deg.BTDC

Fig. 1 DBI images with each condition of ignition timing

ratios are investigated too. The oxidation process of soot particles after nucleation and accumulation processes are cleary seen under a no dilution condition. Increase-decrease rates of soot particles of DBI extinction images shown good agreement with soot the generating resion of two-zone models under the few soot particle genarating conditions. On the other hand, it is seen that the divergence in their relationship under many soot particle generation conditions.

(1)M. Tanaka, et al., Soot Formation from a Three-component Gasoline Surrogate Fuel behind a Reflected Shock Wave, Transactions of the Society of Automotive Engineers of Japan Vol.50, No.5, September 2019.

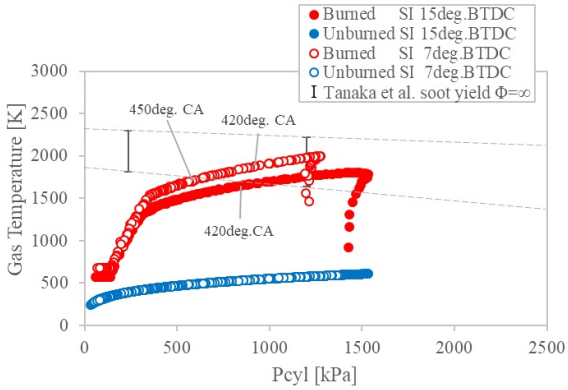


Fig2. Gas Temperatures