Contribution ID: **334** Type: **Poster Presentation**

# PLASMA-ASSISTED COMBUSTION TECHNOLOGY USING NANOSECOND PULSED POWER

*Friday 8 July 2016 14:40 (20 minutes)*

Next generation type of ignition system has been developed in a gasoline internal combustion engine called as "Plasma-assisted combustion technology"[1]. This technology is considered to improve an engine performance through increasing the lean burn flammability and reducing emissions by applying non-equilibrium plasma to gasoline. However, the detailed effect of non-equilibrium plasma on gasoline is poorly understood. In this study, the reforming mechanism of gasoline by non-equilibrium plasma is investigated using gas chromatography.

At first, a nanosecond pulsed power generator using fast recovery diodes was developed to generate non-equilibrium plasma. This pulse generator supplied 9 ns rise-time, 17 ns FWMH, 32.5 kV amplitude pulses into a 1 kΩ load. A non-equilibrium plasma can be produced at a pressure between 0.1 MPa to 0.5 MPa, limited by a vessel.

The pulsed power from this pulsed generator is applied to the spark plug used at conventional ignition system in a gasoline engine. The gasoline is reformed by non-equilibrium plasma at 0.1 MPa. After non-equilibrium plasma is applied to gasoline, the component of reformed gasoline is investigated using gas chromatography. As a results, lower-hydrocarbons, such as methane, ethylene, ethane and propylene, are produced newly. Applying more pulses increases the amount of generation of these lower-hydrocarbons.

It is concluded that the lower-hydrocarbons my be produced by the active species generated by the non-equilibrium plasma. It is well known that lower-hydrocarbons are easier to ignite than higher-hydrocarbons. Plasma-assisted combustion technology could improve the engine performance. We are currently investigating the credibility of our hypothesis and the effect of non-equilibrium plasma to generate lower-hydrocarbons, considering the features of applying pulses.

References

[1] Y. Ju and W. Sun, "Plasma assisted combustion: Dynamics and chemistry,"Prog. Energy Combust. Sci., vol. 48, pp. 21-83. 2015.

**Primary author:** Mr NAKAMURA, Ryo (Kumamoto University)

**Co-authors:** Prof. AKIYAMA, Hidenori (Institute of Pulsed Power Science); Prof. SAKUGAWA, Takashi (Institute of Pulsed Power Science)

**Presenter:** Mr NAKAMURA, Ryo (Kumamoto University)

**Session Classification:** Poster 3-A

**Track Classification:** Plasmas, Discharges, and Electromagnetic Phenomena