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Multi-point Ignition Process in Methane-air Mixtures by Pulsed Microwave Power

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Application of microwave plasma offers a potential method to produce faster combustion in internal combustion engine1. In this paper, microwave multi-point ignition and spatial ignition had been confirmed via high-speed Schlieren imaging technique. The experiment was implemented with the microwave resonant ignition system and the Schlieren optical system. 2ms-3000W-2.45GHz plused microwave power was employed as the ignition energy source to produce initial flame kernel in the combustion chamber. The Schlieren imaging of reflected style was used to illustrate the flame development process with a high speed camera. A quartz glass coated with indium tin oxide (ITO), which ensured the sufficient microwave reflection characteristics and light transmission respectively2, was used as the bottom of the microwave resonant chamber. Ignition experiments were conducted at high pressure of 2 bars of stoichiometric methane-air mixtures. It could be observed in Schlieren images that flame kernels were generated at more than one location simultaneously and flame propagated with different speeds in the combustion chamber. However, the number and the location of flame kernels seemed to be arbitrary.

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