Abstract Submitted
for the GEC10 Meeting of
The American Physical Society

Energy release of a nanosecond pulse corona discharge in atmospheric air-propane mixtures for ignition purposes S. BENTALEB, P. TARDIVEAU, N. MOREAU, F. JORAND, S. PASQUIERS, LPGP-CNRS-UPS, Orsay, France, DIREBIO TEAM — One growing topic of interest in non-thermal plasma field is the use of pulsed corona discharges for car engine ignition. The purpose of this work is a better understanding of the physical mechanisms implied in the ignition of lean mixtures of air and hydrocarbons at high pressure using nanosecond range discharges. Such kind of discharges could improve the energy release in the mixtures, promoting the creation of radicals and excited species instead of direct heat, and the ignition efficiency. A positive high voltage (40-50kV) is applied between a pin electrode and a grounded plane over a short nanosecond range pulse (10-15ns). The energy of the discharge can be modified by changing the voltage and the pulse duration pulse. The diffuse regime which is observed at 1bar in pure air disappears in mixtures with propane and the discharge becomes filamentary. Although the discharge remains generally cold, the ignition of a stoechiometric air-propane mixture at 1bar by a single pulse and self-sustained flame propagation are possible. Compared to the classical car spark plug ignition which occurs in a very small volume, the single nanosecond pulse discharge can ignite a mixture all along a plasma channel, i.e. more than 1cm, and give a cylinder-shaped flame kernel. For comparable energy release, the whole volume can be burnt faster.

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Date submitted: 04 Jun 2010 Electronic form version 1.4