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# Potentialities of plasma multi jets devices at atmospheric pressure for the performance improvement of combustion.

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## Résumé

The variability of gases used in heating and cooking systems may cause the flame lift-off, which can lead its blowout, or even the destruction of the burner. Furthermore these instabilities cause an increasing production of pollutants affecting the sanitary ambient air quality and a decrease in the energy efficiency of the combustion. The establishment of a mixed plasma-combustion system has drawn significant attention. It would compensate the stability deficiencies of the flame, therefore controlling pollutants emissions for improving energy performance of combustion systems [1]. This study focuses on plasma multi jets for the performance improvement of combustion. To obtain a better homogeneous distribution of species, a patented helium plasma multi-jets setup has been used, powered by "GENEPULSE power supply". The electric discharge were initiate in a compact and efficient reactor and propagate it to the injector (a metal rod with six holes  $D = 200 \mu\text{m}$ ) in which is performed the multiplication of jets. In order to characterize the potential of this experimental device, spectra of the free radicals present were recorded using a spectrometer (Ocean Optics MAYA PRO 2000) for 1L/min He flowrate, under different operating conditions; by analyzing metallic targets effects on plasma jets (positions, dimensions of the ring). Investigation has been completed by electrical parametric study (voltage of the power supply). The comparison of spectra evidences, reactive species ( $\text{N}_2$ ,  $\text{OH}^*$ ,  $\text{NO}^*$  and  $\text{O}^*$ ) are produced in higher quantity, as the diameter of the ring decreases, and as the voltage rises, also when the ring is positioned at  $h=+1 \text{ cm}$  from the injector. To combine a plasma multi jets with a laminar lean premixed would enhance combustion.

**Mots-Clés:** plasma, combustion, multi jets, reactive species

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