Study of a dielectric barrier discharge burner for plasma assisted combustion

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Low temperature nonequilibrium plasma is an efficient tool for speeding up chemical processes relative to combustion, and extensive studies of plasma ignition and plasma-assisted combustion are under way at present [1,2]. Dielectric barrier discharge (DBD) is of special interest in this field, because of its design simplicity and ability to be easily integrated in different flow configurations.

The aim of this work was to obtain experimental data to verify numerical modeling of the DBD for initiation of combustion.

In the course of this work a diffuse dielectric barrier discharge was obtained in a coaxial burner. The burner was made out of a glass tube 16 mm inner diameter and 1.5 mm wall thickness. There was a 1 mm gap between the inner anodized aluminum electrode and the tube wall. An outer electrode was a fine steel mesh 5 mm long along the tube wall, providing a homogeneous discharge in air [3] and CH4:Air mixtures. The discharge power was on the order of 10 W. Due to the small discharge gap ignition did not occur.

Experiments were carried out for lean and stoichiometric CH4:Air mixtures. Ozone number densities, produced in the discharge were measured, and in dry air they were on the order of 1016 cm^{-3}, exhibiting a twofold decrease in CH4:Air mixtures.

References

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