Hydrogen selectivity in a gliding arc plasma assisted combustion reactor

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Gliding arc discharges have been used in plasma assisted combustion due their unique properties, like the possibility of operation both in thermal and non-thermal regime. The characteristics of this discharge are consequence of its non-steady state behavior, once that it operates in cycles of ignition, evolution and extinction [1]. When compared with another atmospheric pressure discharges, the gliding arc stands out by the operation with high gas flow rate. Despite the usual name, this plasma resembles a glow discharge [2]. In fact, it can be a gliding arc or a gliding glow [3], which makes it an excellent choice to assist chemical processes like combustion. In this lecture, an overview of recent studies [4, 5] about gliding arc plasma assisted combustion of natural gas operating in fuel rich regime will be made. The chemical analyses of the exhaust gases show that the increase of plasma power leads to a more complete combustion, increasing the CO oxidation to CO_2 and reducing the emissions of unburned hydrocarbons. In conventional combustion, when the combustion is more complete a decrease in H_2 content is expected. But in the experiments, the H_2 concentration grows with plasma power. This result shows that the production of H_2 is favored by the discharge. This increased hydrogen selectivity can be useful for different combustion reactors, despite the raised levels of NO_x. The recent progress in the development of a plasma assisted burner based on these results will also be discussed.

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