# PRELIMINARY STUDY ON MILD COMBUSTION CHARACTERISTICS OF A BUTANOL-CONTAINING FUEL

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The possibility to reach mild combustion conditions using natural gas as fuel has been extensively studied as well as its feasibility with hydrocarbon-hydrogen mixtures; on the other hand, much less information are available concerning the sustainability of mild combustion for liquids and the influence of several operating parameters on mild combustion sustainability for these fuels.
Consequently, this work has been focused on the investigation of the sustainability of mild combustion for liquid hydrocarbons using a dual-nozzle laboratory-scale burner; this configuration allows sustaining mild combustion conditions by directly injecting different liquid hydrocarbons in a mild combustion environment previously attained using a gaseous fuel. A liquid kerosene fuel, with its well-known properties has been used as a reference fuel; the kerosene fuel performances in terms of NOx and CO emissions, temperature profiles and mild combustion stability have been compared to those of a butanol-containing fuel. The investigated fuels evidenced mainly a similar behavior, low temperature gradients within the combustion chamber and very low NOx emissions.
Concerning the use of liquid hydrocarbons as fuels, the mild combustion region in the usual T vs $K_V$ (reactants dilution ratio) diagram enlarges towards higher average furnace temperatures when using a butanol-containing fuel with respect to the kerosene. Moreover, the investigated fuels evidenced the possibility to sustain stable mild combustion conditions at particularly low $K_V$ values; in this region very low amounts of NOx and CO are produced for the fuels investigated, thus supporting the idea that a mild combustion burner can create a suitable environment also for PAH and soot depression, allowing the use of a wide range of liquid wastes and low-BTU liquid fuels, even with unsteady composition or coming from different sources.

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