

# NO formation in high pressure premixed flames: experimental results and validation of a new revised reaction mechanism

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Nitric oxide (NO) formation in high-pressure flames is a research area of great practical interest owing to the high pressures conditions, which exist in all practical power-generation and propulsion engines. The main formation paths of NO in flames have been identified: the thermal NO [1], the prompt-NO [2], the NNH [3] and the N<sub>2</sub>O routes [4]. In the last decade, a special attention was given on prompt-NO formation and it has been demonstrated that the reaction  $\text{CH} + \text{N}_2 = \text{HCN} + \text{N}$  (known to be spin forbidden) has to be replaced by the reaction  $\text{CH} + \text{N}_2 = \text{NCN} + \text{H}$  [5, 6]. Very recently, Lamoureux et al. [7] validated a detailed NO<sub>x</sub> sub-mechanism, NOmecha2.0, for NO<sub>x</sub> chemistry at high temperature on a large database obtained in laminar premixed flames, jet-stirred reactor and plug-flow reactor under sub-atmospheric and atmospheric conditions. The purpose of the present study is to determine capabilities of this revised comprehensive kinetic mechanism, NOmecha2.0, to predict NO formation in high-pressure flames.

Laser Induced Fluorescence was used to measure NO concentration profiles in laminar premixed counter-flow CH<sub>4</sub>/air flames. The equivalence ratio was varied from lean (E.R.=0.7) to rich (E.R.=1.2) conditions and pressure was varied from 0.1 to 0.7 MPa. The validation of the NOmecha2.0 mechanism was performed by comparison with the experimental results. A comparison was also done using the well known GRImech3.0 mechanism [8] associated with NOmecha2.0 or not. Finally, a kinetic analysis is presented to evaluate the contribution of each NO formation pathways (Thermal, Prompt, NNH and N<sub>2</sub>O) with increasing equivalence ratio and pressure.

## References

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