Abstract Submitted
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A novel scaling approach for sooting laminar coflow flames at elevated pressures[1] AHMED ABDELGADIR, SCOTT A. STEINMETZ, ANTONIO ATTILI, King Abdullah University of Science and Technology (KAUST), FABRIZIO BISETTI, University of Texas at Austin, USA, WILLIAM L. ROBERTS, King Abdullah University of Science and Technology (KAUST) — Laminar coflow diffusion flames are often used to study soot formation at elevated pressures due to their well-characterized configuration. In these expriments, these flames are operated at constant mass flow rate (constant Reynolds number) at increasing pressures. Due to the effect of gravity, the flame shape changes and as a results, the mixing field changes, which in return has a great effect on soot formation. In this study, a novel scaling approach of the flame at different pressures is proposed. In this approach, both the Reynolds and Grashof's numbers are kept constant so that the effect of gravity is the same at all pressures. In order to keep the Grashof number constant, the diameter of the nozzle is modified as pressure varies. We report both numerical and experimental data proving that this approach guarantees the same nondimensional flow fields over a broad range of pressures. In the range of conditions studied, the Damkoehler number, which varies when both Reynolds and Grashof numbers are kept constant, is shown to play a minor role. Hence, a set of suitable flames for investigating soot formation at pressure is identified.

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