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Attached and lifted diffusion flames in a mixing layer MOSHE MATALON, Univ of Illinois at Urbana-Champaign, ZHANBIN LU, Shanghai University — Many practical combustion devices are concerned with the stabilization of diffusion flames that are formed by injecting gaseous fuels into a co-flowing stream containing an oxidizer. A primary concern of these configurations is the attachment and lift-off characteristics of the diffusion flame relative to the rim of the injector. In such circumstances, the edge of the flame, which possesses a distinct structure that combines characteristics of both premixed and diffusion flames, is found to play a crucial role in determining the stabilization of the diffusion flame. In this study, we examine the effect of streams of unequal flow rates on the structural and dynamical properties of the edge flame. We show that, depending on the stoichiometric conditions and the diffusive properties of the fuel and oxidizer, the diffusion flame may either be attached to the rim of the injector, lifted and stabilized at a downstream equilibrium position, or blown off by the flow. Under certain conditions the diffusion flame may undergo spontaneous oscillations, whereby the edge of the flame exhibits a back and forth motion along a direction that coincides with the diffusion flame surface.

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