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Mechanism for AC Electric Field Deflection of Flames MICHAEL CHEMAMA, KYLE BISHOP, LUDOVICO CADEMARTIRI, MICHAEL P. BRENNER, GEORGES M. WHITESIDES, Harvard University — Effects of electric fields on flames have been observed and studied since the 19th century. It is well known that the presence of an electric field can modify the shape of a burner or candle-like diffusion flame. Most experimental observations and theoretical analyses focused on DC fields. Recent experiments show that a flame can also be bent and even put out by an AC field. To explain how a zero time average cause can give rise to a net effect on the flame we develop a perturbation theory of the combustion equations modified to allow for the presence of the field and completed by Maxwell's equation. Theoretical and numerical analyses of the equations indeed show that the AC field creates a force whose magnitude is comparable to gravity for high enough fields (1e5 V/m). The dependency of this critical field on the frequency and the effect on the flame shape are also obtained and compared to experimental results.

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