1056-35-1442 **Joseph E Hibdon, Jr*** (j-hibdon@northwestern.edu), Department of Engineering Science and Applied, Math, 2145 Sheridan Rd., Evanston, IL 60208, and **Moshe Matalon**. *Mechanisms of the Instabilities of Ideal Diffusion Flames.*

We present a study aimed at identifying the mechanisms that cause instabilities in diffusion flames, specifically the onset of oscillations. The configuration adopted is the planar unstrained flame with no bulk flow resulting in an ideal diffusion flame where the reactants reach the reaction sheet purely by diffusion. Analysis allows for unequal non-unity Lewis numbers as well as incomplete combustion. The linear stability problem reduces to solving the generalized eigenvalue problem to examine the onset of oscillations of the reaction sheet. The effect of the instability on the flow field surrounding the reaction sheet is examined for a wide range of parameters including the distinct Lewis numbers associated with the fuel and oxidizer and the initial mixture strength. An increase in the thermal expansion is found to be a stabilizing influence on the onset of oscillations. The dependence of the frequency on the parameters is examined for the planar diffusion flame with one reactant supplied in a uniform stream and the other diffusing against the stream, and is related to experimental results. It is found that the frequency is sensitive to the initial mixture strength of the reactants and the Lewis numbers. (Received September 21, 2009)