Analyzing the Influence of Electric Field on Flame through Electro-Hydrodynamics

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Introduction

The effects of electric fields on combustion flames have been studied by using several types of experimental techniques as well as few numerical methods. The flame is influenced by the electric field mainly due to the charges present as a result of chemical reactions that take place in the flame. From earlier experiments it was established that the electrical power required to do so is very less when compared to the combustion energy generated. A simple model is developed to simulate the action of DC electric fields on the flame. The temperature profile is found to be similar to those obtained earlier. The inter-relation between parameters like inlet velocity, applied potential, deflection and the velocity field are studied. The deflection produced in the flame, at fixed transversely applied potential, decreases rapidly with the input velocity initially, and later gradually. The deflection produced in the flame, at certain input velocities, increases rapidly with the transversely applied potential initially, and later gradually. The consequence of axially applied potential, with the lower potential at the inlet, decreases the magnitude of the velocity field at a very slow rate. The results obtained from the simulations can be used qualitatively to determine the nature and extent to which electric fields can modify flame shapes.