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EXPERIMENTAL INSIGHT INTO THE EFFECT OF SOUND INTENSITY ON SMOLDERING COMBUSTION

Abstract

Through proper experimentation, the effect of sound on smoldering combustion is analyzed in the aid of regression rate. The influence of sound on flames is well known however, its effect on flameless combustion is an aspect yet to be explored. The smoldering of solid fuels is a subject of practical and functional significance as it covers wide range of engineering and industrial applications. However,the direct implication also includes huge loss to mankind by emission of toxic gases, destruction of large amount of biomass, excessive soil damage and is a potential initiating source of fires. Smoldering is a surface phenomenon and direct function of forward heat transfer from burning to unburnt surface which advances the ignition front normal to the fuel surface. The phenomenon is studied under two classes as: Opposed (Reverse Smoldering) and Concurrent (Forward Smoldering). In forward smoldering, the air moves in the same direction whereas in reverse smoldering air moves in direction opposite to smoldering front. The need to prevent and control smoldering has necessitated an active research effort aiming at understanding the fuel regression rates under varying operating conditions. The study of flameless from of combustion is primarily driven by the need to have better fire safety and skillful engineering applications by means of enhanced understanding of the mechanisms which control the regression rates under different operating conditions. One aspect which had not been addressed in the literature is the way the smoldering responds to the presence of sound.Sound is well known as a form of energy in the capacity of pressure wave and is expected to affect the forward heat feedback.The changes in heat transfer are very likely to have notable effects on smoldering in terms of regression rates changes. The present work attempts physical insight into the effect of sound frequency and source distance on smoldering. The specific objective of the study is to investigate the role of sound in smoldering and to examine the role of key controlling parameters. An experimental setup was upraised comprising of a sound source with essential controls for varying frequency. The incense sticks were used as fuel strips and the effect is examined in terms of regression rate with and without sound. In this work, the location and frequency of sound source is systematically varied keeping the ignition front fixed and the effect on regression rates is explored for selected cases of reverse and forward smoldering.