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UPWARD SPREAD FORCED SMOLDERING PHENOMENON: EFFECTS AND APPLICATIONS

Abstract

Smoldering is the most persistent type of combustion. Smoldering can take place for very long periods (hours, days, months) if there is abundance of fuel. This type of combustion causes quite a notable number of accidents and is one of the prime suspects for fire and safety hazards. It can be ignited with weaker ignition and is more difficult to suppress than flaming combustion. Upward spread smoldering is the case in which the air flow is parallel to the direction of the smoldering front. This type of smoldering is largely uncontrollable and necessitates a need to study.

A simplified experimental setup will be raised to study the upward spread smoldering, its effects due to varying forced flow and also its effects when it is takes place in presence of external sources such as acoustics, lasers, magnetic fields etc. Linear and non-linear configurations will be studied depending on varying forced flow effects on upward spread smoldering. Effect of varying forced flow on upward spread smoldering will be observed and studied for the cases of: (i) in presence of external heat source (both single and multiple in linear and non linear configurations) (ii) in presence of external heat sink(both single and multiple in linear and non linear configurations) (iii) in presence of coupled external heat sinks and heat sources (in linear and non linear configurations) (iv) in presence of external alternative energy sources (acoustic, laser, magnets and coupled with all). The experimentation will be followed by the theoretical and computational validation of experimental results.

This work highlights the importance of fire and safety hazard and means of better combustion for all kinds of scientific research and practical applications. The knowledge acquired from this work can be applied to various engineering systems ranging from aircrafts, spacecrafts and even to buildings fires, wildfires and help us in better understanding and hence avoiding such widespread fires.