FLAMMABILITY TESTING OF FIRE RESISTANT FABRICS

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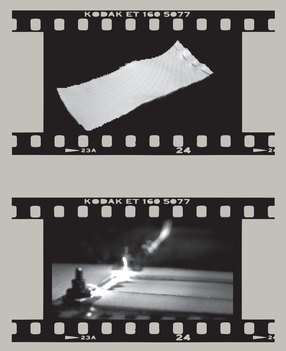
Introduction

Fire fighters, astronauts and race car drivers among others use protective clothing made of fire resistant fabrics in order to prevent injuries such as skin burns in the case of a fire. Once ignition occurs, fire resistant fabrics reduce or stop the fire spread depending on environmental conditions.

Fire resistant fabrics are primarily intended for use in air, however, there are some applications in which oxygen concentration can be higher, such as in spacecraft. In particular, NASA's most recent human space exploration vehicles have been designed to have a lower cabin pressure and higher oxygen concentration. The focus of this project is to study the effect that oxygen concentration has in different environmental conditions.

Experimental Setup

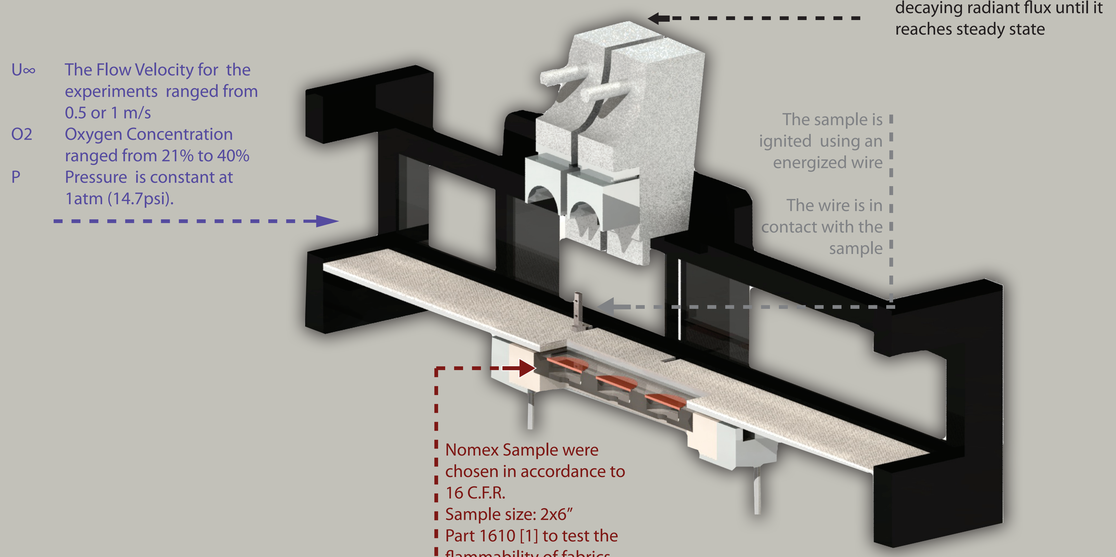


21% Oxygen

In normal ambient conditions most fire resistant fabrics are not flammable.

35% Oxygen

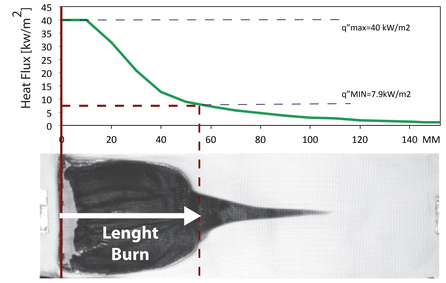
In environment conditions (O_2 concentration, pressure, external radiation, etc.) may make these fabrics flammable.



Parameters

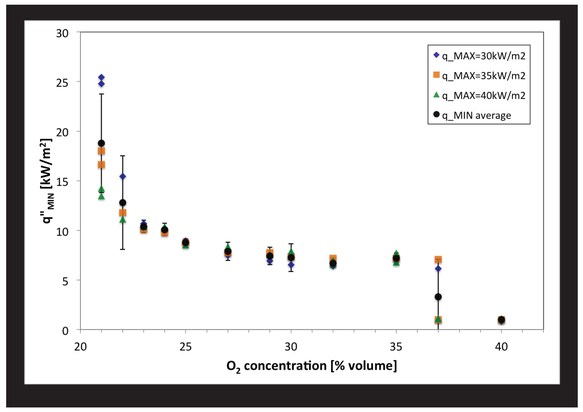
1. External Radiation (Fire)
2. Oxygen Concentration (Air inside space craft)
3. Flow Velocity (atmosphere inside space craft)

Determine how much the material it burns



Results

Increasing $[O_2]$ lead to lower values of q"MIN, at sufficiently $[O_2]$ fabrics burn completely.



Limiting Oxygen Index (LOI) is the minimum O_2 concentration for flame spread.

Present experiments show that LOI of fire resistant materials are dependent on environmental conditions.

External radiant flux and high oxygen concentrations increase flame spread rates in fire-resistant materials. This work may have relevant consequences in design of fire protective clothing in different environments.

Results of this work is critical to the desing of future space craft.

Future Work

Combining variation of five parameters: External Radiation, Oxygen Concentration, Pressure, Microgravity, Flow Velocity.

Testing of different materials

Acknowledgments

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