

# FLAMMABILITY DIAGRAMS OF H<sub>2</sub>/CO/CH<sub>4</sub> MIXTURES DILUTED WITH HELIUM OR CARBON DIOXIDE

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High temperature gas-cooled reactors are graphite moderated and helium cooled. The primary system consists of reactor pressure vessel, steam generator and hot gas duct vessel. The water ingress into the reactor pressure vessel can occur in case of the rupture of a heat transfer tube of the steam generator. The mixture of helium and steam will subsequently enter the reactor and will lead to a graphite corrosion of both fuel elements and graphite structures. This oxidation process can be responsible of the formation of He-H<sub>2</sub>-CO-CO<sub>2</sub>-H<sub>2</sub>O-CH<sub>4</sub> mixtures. It is then important to assess the ignition risk of these mixtures.

The aim of this study is to determine the flammability limits of 4 different mixtures containing different amount of H<sub>2</sub>, CO, and CH<sub>4</sub> initially at 300 K and 100 kPa. The effect of the dilution by CO<sub>2</sub> or helium has been investigated over a wide range of fuel/air ratio. These flammability limits have been determined in a spherical vessel using a laser spark induced ignition at the center of the vessel. A high speed imaging is used to monitor the occurrence of the combustion (flame recording) or to assess that the local ignition does not give rise to a sustainable flame and that the flammability limit is reached. A high frequency pressure transducer is mounted flush with the inner wall to measure any pressure increase due to a successful ignition.

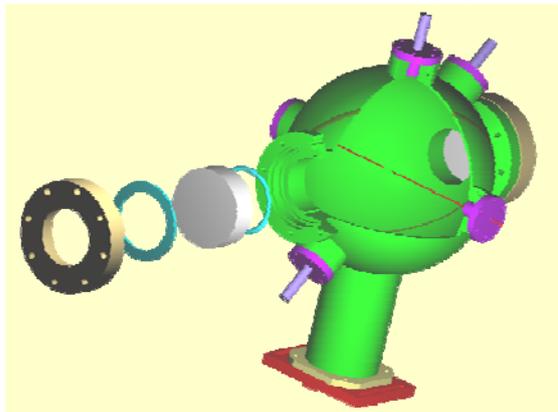


Figure 2 : Schematic of the Spherical Bomb.

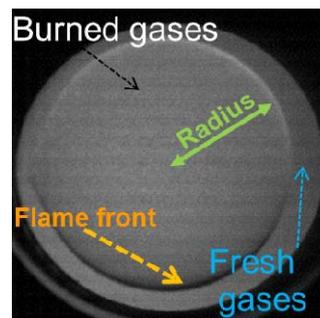


Figure 1 : Snap shot of a flame during its propagation in the bomb.