

Characterization of the Flammable and Explosive Behavior of Hydrogen

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Hydrogen is considered to be an important future energy carrier for significantly reducing greenhouse gas emissions. However, only limited experimental data on hydrogen flammability and explosive behavior is available. These data show that the flammable and explosive hazards for hydrogen are greater than for conventional fuels. This paper presents an ambitious one year experimental study to understanding of the flammability of hydrogen to insure hydrogen safety and to realize hydrogen the economy in near future.

The experimental data were used to produce a triangular flammability diagram showing the complete flammable zone for hydrogen in a three component system composed of hydrogen, oxygen and nitrogen – the first time a complete triangle diagram for hydrogen has ever been completed. The results show that the flammable zone for hydrogen is a lot larger than for other typical hydrocarbons. The pressure – time data sets were also analyzed to determine the maximum pressure and the deflagration index, both important parameters to characterize hydrogen combustion.