

# Multiphase Bunsen burner set-up for investigating solid chemical inhibitors in hydrogen-air explosions

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## Abstract

Solid inhibitors such as sodium bicarbonate and potassium carbonate are widely in the industry as a suppressant. In recent years systems have been developed to use these inhibitors as a safety measure for vapour cloud explosions [1]. The joint industry project (JIP) '*Risk-reduction for hydrogen installations by partial suppression of explosions*' (HyRISE) aims to develop a similar system for the suppression of hydrogen-air explosions in congested and confined environments.

One of the main objectives is to develop fundamental knowledge. Some initial experiments have been performed and models based on these experiments have been developed. However, a better experimental set-up is needed to validate these models and get a better understanding of the physical and chemical interactions between the inhibitors and the hydrogen-air flame. A multiphase Bunsen burner is in development for this purpose. This burner will be designed to have solid inhibitor particles in the flow with premixed hydrogen-air with continuous monitoring of the dust concentration. The flame will burn under laminar or near laminar conditions. This will allow for measurement of the laminar burning velocity effected by the inhibitors. In addition, the particle size distribution will be measured before and after entering the flame to determine the amount of inhibitor consumed by the flame.

## References

- [1] van Wingerden, K. and Hoorelbeke, P., 2011, On the potential of mitigating vapour cloud explosions using flame inhibitors, 11AIChE - 2011 AIChE Spring Meeting and 7th Global Congress on Process Safety, Conference Proceedings.