XXXV SALÃO de INICIAÇÃO CIENTÍFICA

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Evento	Salão UFRGS 2023: SIC - XXXV SALÃO DE INICIAÇÃO CIENTÍFICA DA UFRGS
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Local	Campus Centro - UFRGS
Título	Flame velocity through obstacles in a closed duct equipped with a flame arrester
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Gaseous fuels can trigger explosions in industrial facilities when ignited and when there are obstructions that accelerate the flame. Hydrogen is especially prone to rapid ignition and detonation due to its high reactivity. However, it is also an intriguing fuel option due to its high energy content and renewability. Detonations can cause significant damage to infrastructure and harm to people, so it is crucial to understand and mitigate the behavior of gas mixtures containing hydrogen.In this study, a fuel mixture comprising 75% natural gas and 25% hydrogen gas was employed in experiments, with synthetic air serving as the oxidizer at an equivalence ratio of 1. Ignition was initiated within the gas mixture. The objective was to analyze flame propagation within a closed duct and determine the ratio between the maximum flame speeds with and without obstacles to characterize its behavior. Several stages of flame propagation were observed in the unobstructed duct: semi-spherical propagation, finger flame propagation, flame front inversion, and the tulip flame. In contrast, in the obstructed test, semi-spherical propagation was also observed, but in later stages, a mushroom-shaped flame propagated. Results indicate that the maximum velocity with obstacles is approximately 12 times greater than in the unobstructed tube for this particular mixture and configuration. Additionally, a notable difference between the cases is that, in the absence of obstacles, the maximum speed is observed in the first window, whereas in the presence of obstacles, it occurs in the second window.