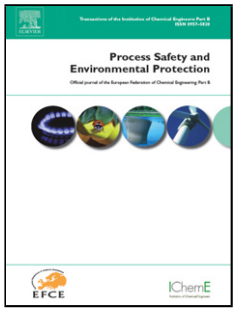

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Experimental study of DDT in hydrogen-methane-air mixtures in a tube filled with square orifice plates

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Abstract:

Deflagration to detonation (DDT) experiments with stoichiometric hydrogen-methane-air mixtures at ambient pressure (1 atm) and temperature (293K) were carried out in a 112×112mm by 6m long tube with various obstacle configurations. The hydrogen fraction in fuel mixtures ranged from 0 to 1. Two types square orifice plates with opening sides of 86.8mm and 70.8mm (blockage ratios of 0.4 and 0.6), spaced at 1, 2, 3 and 4 times the tube height were employed. Flame signals were detected by photodiodes spaced evenly, from which the average velocity could determined. The detonation cell size was obtained using soot foil technique. CJ detonations can still propagate in less sensitive mixtures with larger detonation cell sizes. At the DDT limits, the ratio of the height of the orifice