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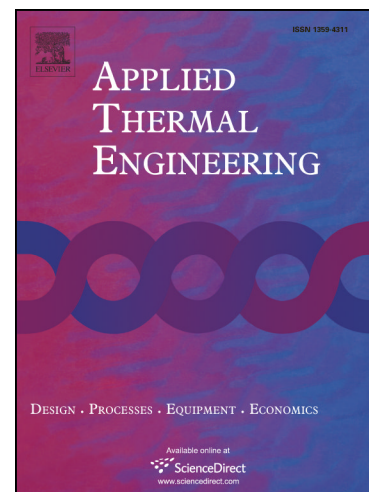
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A non-premixed rotating detonation engine using ethylene and air

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Abstract Only a few studies on ethylene-air rotating detonation engines were conducted due to the great difficulty of quick ethylene-air mixing. Hydrogen or oxygen was added into ethylene-air mixtures, or premixed ethylene-air mixtures were used in some previous studies, to obtain rotating detonation waves. Non-premixed rotating detonation waves of high speeds for ethylene and air sources at room temperatures were obtained in the present study, proving ethylene is feasible for air-breathing rotating detonation engines. The hollow combustor channel here had an outer diameter of 100 mm. Fuel and air were injected into the combustor from 150 cylindrical orifices of a diameter 0.8 mm and a circular gap with a throat width of 1 mm, respectively. The detonation speeds were 1256-1653 m/s for the air flow rates 465-689 g/s and equivalence ratios 0.47-1.06. Most of the speeds were above 80 % of Chapman-Jouguet values. Both high-speed images and dynamic pressure sensors showed there was one rotating detonation wave in all the operating conditions.

Keywords Rotating detonation engine; ethylene; experiment; hollow combustor; high speed detonation

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