
VI.H.2 Hydrogen-Assisted IC Engine Combustion as a Route to Hydrogen Implementation

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One is for hydrogen to be mixed with other fuels, specifically natural gas, to enhance performance in existing vehicles (e.g., compressed natural gas transit buses) and provide a practical and marketable avenue to begin using hydrogen in the field. A second is to use hydrogen to enable alternative combustion modes, such as homogeneous charge compression ignition, to permit enhanced efficiency and reduced emissions.

Approach

This approach is to focus on developing the underlying fundamental information to support technologies that will facilitate the introduction of coal-derived hydrogen into the market. Two paths are envisioned here for hydrogen utilization in transportation applications. One is for hydrogen to be mixed with other fuels, specifically natural gas, to enhance performance in existing vehicles (e.g., compressed natural gas transit buses) and provide a practical and marketable avenue to begin using hydrogen in the field. A second is to use hydrogen to enable alternative combustion modes, such as homogeneous charge compression ignition, to permit enhanced efficiency and reduced emissions.

Objectives

- Optimization of hydrogen-natural gas (H₂-NG) mixture composition and utilization through laboratory studies of spark-ignition engine operation on H₂-NG and numerical simulation of the impact of hydrogen blending on the physical and chemical processes within the engine.
- Examination of hydrogen-assisted combustion in advanced compression-ignition engine processes.

Introduction

This research focuses on developing the underlying fundamental information to support technologies that will facilitate the introduction of coal-derived hydrogen into the market. Two paths are envisioned here for hydrogen utilization in transportation applications.

Accomplishments

- Optimized a mixture of hydrogen and natural gas and its utilization through laboratory studies of spark-ignition engines.
- Evaluated, through numerical simulation, the impact of hydrogen blending on the physical and chemical processes within the engine.

Future Directions

Examine and evaluate hydrogen-assisted combustion in advanced compression-ignition engines.