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The usage of non-aligned multi-circular winding injectors for efficient fuel mixing inside the scramjet engine

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Highlights

- The role of zigzag injector for fuel mixing of hydrogen jet in **combustion chamber** is investigated.
- Computational method is applied to model fuel jet in **supersonic cross flow**.
- Fuel mixing and shock wave interactions in zigzag arrangements are comprehensively studied.

Abstract

The usage of zigzag multi-jet configuration for efficient fuel circulation along the **supersonic combustion chamber** has been extensively examined in this article. To analyze the flow and **fuel jet** interactions, **computational fluid dynamic** is applied as an efficient technique to visualize the flow and **fuel jet** in the zigzag injection system. Injection via an annular nozzle is compared with coaxial air and fuel jet to find the effective mechanism for well-organized fuel mixing in the **combustion chamber** of the **scramjet engine**. The circulation and fuel mixing of the zigzag injection is inspected at a **supersonic** air stream with Mach=4. The contour of the Mach value and stream shows that the deflection of the air stream after contact with the core of the upstream jet redirects to the core of the downstream jet and consequently, the fuel mixing is enhanced in the **combustion chamber**. The usage of an internal air jet expands the performance of fuel mixing of annular jets up to 100% in the zigzag nozzle arrangement.