

Modified Burn Behavior of Propellant with Embedded Nitinol Wires

Shape-memory-wire actuated propellant geometry that dynamically controls burn rate for throttling or precision actuation.

Researchers at Purdue University have developed a method of modifying the burn behavior of solid propellants by changing the propellant geometry on command. The Purdue technology modifies the surface area of the propellant with embedded nitinol wires that cause cracks in the propellant once actuated. Because this changes the behavior of the burn process, this method can be used to control burn behavior on command. Applications for this technology are focused on propulsion-based actuators, such as those in vehicle airbag deployment systems. Other uses can be found in solid rocket engines.

Advantages:

- Finer control of airbag deployment
- Thrust vectoring of solid rockets
- Control over burn behavior for propulsion-based actuators

Applications:

- Airbags
- Actuators
- Gas generants
- Solid rocket engines

Technology Validation: This technology has been validated through experimentation with a scaled down version of the throttleable propellant. This experiment showed that a propellant with a burn rate of 4.5 g/s can be throttled to 9 g/s through the actuation of shape memory alloys.

Technology Readiness Level: 3

Technology ID
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Category

Aerospace & National
Security/Hypersonics &
Propulsion Systems
Materials Science &
Nanotechnology/Composites &
Hybrid Materials
Chemicals & Advanced
Materials/Materials Processing &
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Related Publications:

Altering the Burning Rate of a Propellant with Shape Memory Alloy. AIAA SCITECH 2023 Forum. <https://doi.org/10.2514/6.2023-2691>

TRL: 3

Intellectual Property:

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