

Space Launch Initiative's Propulsion project completes catalyst sensitivity testing with hydrogen peroxide

NASA engineers, along with General Kinetics of Lake Forest, Calif., have recently completed an effort to test the sensitivity of hydrogen peroxide catalysts to propellant impurities. Catalysts are used to speed up the decomposition process of certain chemicals to create usable by-products. Hydrogen peroxide is a desirable propellant for the second generation reusable launch vehicle because it is non-toxic, environmentally friendly, and stored at room temperature.

The sensitivity tests run 98 percent hydrogen peroxide through a pipe-like test article that contains a filter-like metallic screen. The metallic screen interacts with the hydrogen peroxide, causing the hydrogen peroxide to rapidly decompose to super heated steam and oxygen. The steam and oxygen can then be used as an oxidizer for a rocket engine or to drive a turbopump.

Engineers tested the metallic screens with hydrogen peroxide solutions that included various stabilizers, such as tin, phosphate, and nitrate. Stabilizers are added to the hydrogen peroxide solution during production to offset any typical contaminants that might have come in contact with the solution — such as aluminum, organic carbon compounds, or stainless steel — and cause the peroxide to decompose during storage. High levels of these substances can deteriorate the efficiency and life of the catalyst. By testing solutions of hydrogen peroxide with various stabilizers and contaminants, NASA engineers can understand the tolerance of the catalyst to impurities, and can develop an industry standard for rocket grade hydrogen peroxide. The tests can also verify a hardware technology that will increase reliability and operability by using a long-life component for the second generation reusable launch vehicle.

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