

Alternative Fuel Transport using semi volatile Ammonia

Dennis A. Lobmeyer, P.E., ASRC Aerospace;
John E. Brandenburg, Ph.D., Florida Space Institute

A major constraint to exploring space is the ability to carry the necessary fuel and oxidizer for a return trip. The aerospace community is continuously looking for methods to derive the fuel or oxidizer from “In-situ” resources. In the case of Mars, one option would be to derive the oxidizer from the CO₂ rich atmosphere. This process relies on the ability to deliver hydrogen from earth to mars. The weight of the fuel is only 5%-10% of the overall system weight required to transport it. The Space Shuttle and some expendable launch vehicles utilize liquid hydrogen providing a “high” density storage technique. Alternative storage methods that would achieve hydrogen capacities greater than 10% are much sought after for both terrestrial and space based applications. This paper describes one method of transporting hydrogen to Mars by anhydrous ammonia. By chemically binding the hydrogen in the ammonia a storage capacity greater than 15% (mass of hydrogen to mass of total system) is theoretically possible. The ammonia is then dissociated into hydrogen and nitrogen using a patented microwave electro-thermal plasma reactor. The hydrogen is then available as a feedstock for processing or as a fuel for a fuel cell or propulsion system.