Burning Rate Characterization of Ammonium Perchlorate Pellets Containing Energetic and Catalytic Additives

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Abstract

Ammonium perchlorate (AP) is a common oxidizer utilized in composite propellant applications ranging from military use to space exploration. The regression rate of AP in composite propellants relative to the binder can have significant impacts on the global burning rate, and thus is important to evaluate on its own. Gaining a deeper understanding of the underlying mechanisms of AP combustion can enhance the ability to properly control these effects in composite propellants. The combustion behavior and burning rates of baseline AP pellets with high purity have been evaluated in a constant-volume bomb at pressure of 3.4-34.4 MPa (500-5,000 psia) and compare well with the available literature. AP pellets manufactured with AP particles coated in TCP were observed do deflagrate slower, and exhibited a significantly higher low pressure deflagration limit. AP pellets containing metal oxide and energetic additives are currently being evaluated for their combustion behavior and burning rates. Preliminary results indicate that the burning rate of AP can be selectively tailored by the incorporation of proper catalysts.