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Simulations of Energetic Materials for Rocket Propulsion: Obtaining More "Bang for the Buck"

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Abstract: Powderized **aluminum** has long been used as an energetic ingredient in rocket propellant formulations, comprising approximately 15-20% of some conventional ammonium perchlorate solid propellant formulations. However, the performance of **aluminum** is reduced by the rapid formation of an **aluminum oxide** overcoat on **aluminum** particles prior to combustion, which also inhibits efficient burning. Furthermore, formation of the **oxide** overcoat severely reduces the potential advantages of using high surface-to-volume-ratio ultrafine **aluminum** particles, which would otherwise have highly desirable properties such as enhanced burn rates. In order to inhibit the rapid formation of an **oxide** overcoat on the ultrafine **aluminum** particles without simultaneously degrading performance, it has been proposed to coat the **aluminum** particles with an energetic material such as HMX.

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