## Experimental Investigation and Modeling of Oxidizer Size and Concentration Effects on Composite <u>AP/HTPB Propellant Burning Rates</u>

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The effects of altering ammonium perchlorate (AP) particle size or loading in composite AP/HTPB solid propellants are well documented. Existing propellant datasets include these variations, but they have significant holes in their current data span. In the current study, IPDI-cured composite AP/HTPB propellants were manufactured with AP loadings between 70-85% and AP sizes between 20-200  $\mu$ m, and propellant burning rates were evaluated between pressures of 2,250-5,000 psi. Decreasing the AP particle size or increasing the AP loading yielded increases in burning rate, as expected from known results from the literature. The AP particle size effect is more drastic than that of the AP loading. The developed dataset was coupled with several existing propellant datasets to develop a simple empirical correlation that captures these effects. The developed correlation accurately predicts propellant burning rate for a large span of AP particle sizes and loadings, as well as test pressure. The classical three-flame model is derived from first principles, coupled with the latest available thermophysical data, and implemented to predict burning rates. The model is compared to experimental results and shows good agreement.