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Calculation Study on Ignition of Boron Particle of Ducted Rocket Secondary Chamber

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Abstract: The effects of various parameters on boron particle ignition of ducted rocket secondary chamber were studied with the model developed by the King. These parameters include initial oxide thickness, initial particle size, ambient temperature, pressure and oxygen mole fraction. The minimum gas temperature required for ignition is above 1900 K. The effects of total pressure and oxygen mole fraction on ignition time are found to be fairly complex. At low oxygen mole fractions, increasing total pressure leads to more difficult ignition while at high oxygen mole fraction, the reverse is true. Ignition time generally decreases with decreasing particle size. The ignition time is predicted to increase strongly with decreasing gas temperature.

Key words: physical chemistry; fuel-rich propellant; ducted rocket motor; boron particle; ignition; combustion

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