Mathematical Model of Energy Release due to Self-oxidation-reduction Reaction of Energetic Materials in Closed Chamber

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If we put energetic material made up of fuel and oxidizer in closed chamber and ignite, an oxygen atom which bonded with oxidizer obtain activation energy. Therefore, oxygen atom breaks the bonding with oxidizer and becomes free oxygen atom which can oxidize fuel. Heat generated from the reaction activates another oxygen atom. As a consequence, oxidation-reduction reaction is repeated until whole fuels are burned out. By the self-oxidation-reduction reaction, exothermic reaction which release heat, light and gas, etc. occurs and fuels rapidly burned. Because this phenomenon could be occurred under anaerobic conditions, it is applying to energy release of spacecraft and rocket needed to propel under anaerobic conditions. Due to growing interest in domestic aerospace industry, it is necessary to develop energy release model in order to apply to various research such as energy release performance evaluation and energetic material aging study, etc. This study makes mathematical model such energy release phenomenon of energetic material as pressure vs time equation. Additionally, pressure change according to time was also obtained and compared using various equations of state.