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Thermal Decomposition of Mixtures of Ammonium per chlorate with Nd_2O_3 and Pr_2O_3

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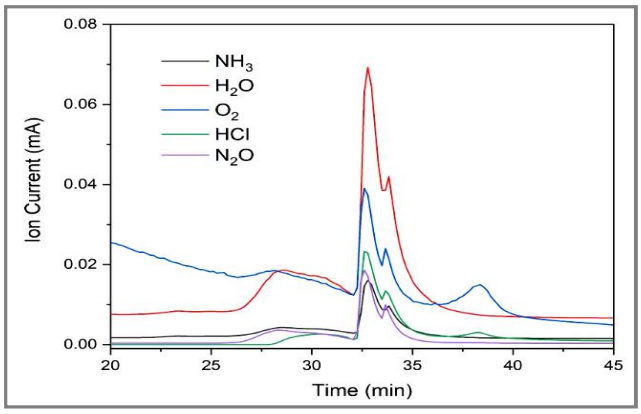
ABSTRACT

Thermal decomposition of ammonium per chlorate (AP) in the presence of lanthanide oxides L_2O_3, where L=Nd, and Pr, has been studied with TG–MS approach towards understanding the mechanistic aspects of thermal decomposition. Nd_2O_3 has no appreciable influence on the onset temperature of AP decomposition; and it brings down the end set temperature of AP decomposition. Pr_2O_3 influences both the LTD and HTD of pure AP. Addition of either Nd_2O_3 or Pr_2O_3 does not catalyze the evolution of HCl. Presence of Pr_2O_3 catalyzes both the LTD and HTD of AP. Both the catalysts contribute to the oxidation of ammonia to NO_2, rather than NO as in the case of pure AP. Release of O_2 is another favorable contribution by these oxides that have profound influence on the energetic of composite solid rocket propellants based on AP.

Graphical Abstract



MS Peaks corresponding to AP – Nd_2O_3 System.

Keywords: Ammonium per chlorate, Nd_2O_3, Pr_2O_3, TG-MS.