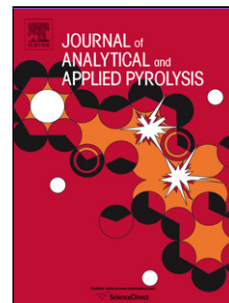


Accepted Manuscript

Title: Thermo-analytical study of 2,2,2-trinitroethyl-formate as a new oxidizer and its propellant based on a GAP matrix in comparison with ammonium dinitramide

Authors: Mohamed Abd-Elghany, Ahmed Elbeih, Thomas M. Klapötke



PII: S0165-2370(18)30214-6
DOI: <https://doi.org/10.1016/j.jaap.2018.05.004>
Reference: JAAP 4323

To appear in: *J. Anal. Appl. Pyrolysis*

Received date: 6-3-2018
Revised date: 6-4-2018
Accepted date: 7-5-2018

Please cite this article as: Mohamed Abd-Elghany, Ahmed Elbeih, Thomas M. Klapötke, Thermo-analytical study of 2,2,2-trinitroethyl-formate as a new oxidizer and its propellant based on a GAP matrix in comparison with ammonium dinitramide, Journal of Analytical and Applied Pyrolysis <https://doi.org/10.1016/j.jaap.2018.05.004>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Thermo-analytical study of 2,2,2-trinitroethyl-formate as a new oxidizer and its propellant based on a GAP matrix in comparison with ammonium dinitramide

Mohamed Abd-Elghany^{a*}, Ahmed Elbeih^b, Thomas M. Klapötke^{a*}

^a Department Chemie, Ludwig-Maximilians Universität München, 81377 München, Germany

^b Military Technical College, Kobry Elkobbah, Cairo, Egypt

*E-mail: moabch@cup.uni-muenchen.de

Highlights

- A new TNEF/GAP propellant was studied in comparison with ADN/GAP propellant.
- Thermo-analytical study of the samples were investigated by DSC and TG/DTG.
- Different methods were used to determine the decomposition kinetics of the samples.
- TNEF is a promising oxidizer which might be used in propellant formulation.

Abstract

A new high energy dense oxidizer (HEDO) 2,2,2-trinitroethyl-formate (TNEF) was prepared and characterized by nuclear magnetic resonance (NMR). A new propellant based on glycidyl azide polymer (GAP) and TNEF was prepared. Thermo-analytical study of TNEF in comparison with ammonium dinitramide (ADN) and their propellant formulations based on GAP were investigated. The decomposition gaseous products and the combustion characteristics of the propellants were determined by using thermodynamic code (EXPLO5_V6.03). Scanning electron microscope (SEM) technique was applied to clarify the crystal morphology of the oxidizers in addition to the homogeneity of the propellants ingredients. Impact and friction sensitivities of the oxidizers and the GAP binder were measured. Differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA) techniques were used to study the pyrolysis of the oxidizers as well as the prepared propellants. The decomposition kinetics were determined by Kissinger and Kissinger–Akahira–Sunose (KAS) methods. The thermal degradation of ADN is faster than TNEF oxidizer. ADN and TNEF have melting temperatures at 95.5 and 127.1 °C and maximum decomposition temperature at 183.5 and 210.1 °C respectively. In addition, TNEF has activation energy in the range of 131-146 kJ mol⁻¹, while ADN has activation energy in the range of 114-117 kJ mol⁻¹. TNEF has specific impulse (250.1 s) higher than ADN (202.4 s). TNEF is a promising oxidizer to be used in composite solid rocket propellants.

Keywords: TNEF; ADN; GAP; Thermal degradation; decomposition kinetics

Download English Version:

<https://daneshyari.com/en/article/7606229>

Download Persian Version:

<https://daneshyari.com/article/7606229>

[Daneshyari.com](https://daneshyari.com)