

## D i s s e r t a t i o n   D e f e n s e

### M k h i t a r   H o b o s y a n

Date: : Friday, April 20th, 2018

Time: 10:00 am - 12:00 pm

Location: Cavalry 106

Campus: UTRGV

Advisor: Karen Martirosyan

### A b s t r a c t

#### **Tuning the dynamic properties of nano-energetic gas generators based on bismuth and iodine compounds**

There is a growing interest on novel energetic materials called Nanoenergetic Gas-Generators (NGG), which are alternatives to traditional energetic materials including pyrotechnics, propellants, primers and solid rocket fuels. NGGs are thermite types of formulations that can rapidly release large amounts of gaseous products exhibiting fast moving thermal wave. The pressure discharge dynamics, impact sensitivity, long term stability and other critical properties depend on the particle size and shape, as well as assembling technique and intermixing degree between heterogeneous components. The extremely high energy density and the ability to tune the dynamic properties of the energetic system makes NGGs based on bismuth and iodine components ideal candidates for emerging applications. The thermodynamic calculations and experimental study demonstrates that NGGs based on iodine and bismuth oxide/hydroxides mixed with aluminum nanoparticles are the most powerful formulations to date and can be used potentially in microthrusters technology with high thrust-to-weight ratio with controlled combustion and exhaust velocity for space applications. The resulting nano thermites can generate extreme values of pressure discharge up to 14.8 kPa m<sup>3</sup>/g. They can also be integrated with multi-wall carbon nanotubes to form laminar composite yarns with high power actuation of up to 4700 W/kg as well as can be used in biocidal agents to effectively destroy harmful bacteria in seconds with 22 mg/m<sup>2</sup> minimal content over infected area.

#### Contact Information

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