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Self-Assembled Nano-energetic Gas Generators based on Bi₂O₃ MKHITAR HOBOSYAN, TYLER TREVINO, KAREN MARTIROSYAN, Department of Physics and Astronomy, University of Texas at Brownsville — Nanoenergetic Gas-Generators are formulations that rapidly release a large amount of gaseous products and generate a fast moving thermal wave. They are mainly based on thermite systems, which are pyrotechnic mixtures of metal powders (fuel- Al, Mg, etc.) and metal oxides (oxidizer, Bi₂O₃, Fe₂O₃, WO₃, MoO₃ etc.) that can generate an exothermic oxidation-reduction reaction referred to as a thermite reaction. A thermite reaction releases a large amount of energy and can generate rapidly extremely high temperatures. The intimate contact between the fuel and oxidizer can be enhanced by use of nano instead of micro particles. The contact area between oxidizer and metal particles depends from method of mixture preparation. In this work we utilize the self-assembly processes, which use the electrostatic forces to produce ordered and self-organized binary systems. In this process the intimate contact significantly enhances and gives the ability to build an energetic material in molecular level, which is crucial for the pressure discharge efficiency of nano-thermites. The DTA-TGA, Zeta-size analysis and FTIR technique were performed to characterize the Bi₂O₃ particles. The self-assembly of Aluminum and Bi₂O₃ was conducted in sonic bath with appropriate solvents and linkers. The resultant thermite pressure discharge values were tested in modified Parr reactor. In general, the self-assembled thermites give much higher-pressure discharge values than the thermites prepared with conventional roll-mixing technique.

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