MESOPOROUS IRON OXIDE ENERGETIC COMPOSITES WITH SLOW BURN RATE, SUSTAINED PRESSURE AND REDUCED ESD SENSITIVITY FOR PROPELLANT APPLICATIONS

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The objective of this thesis is to synthesize a slow burning nanoenergetic formulation of mesoporous iron oxide with sustainable pressure characteristics and reduced electrostatic discharge ignition sensitivity.

The choice of iron oxide is made because of its redox reaction with Al-particles. We have attempted to reduce the combustion wave velocity by infiltrating polymers inside porous Fe_2O_3 and combining it with Al-nanoparticles. Furthermore, modifications with the polymers can reduce the electrostatic discharge (ESD) ignition sensitivity of nanoenergetic composites.

The composites reported in this thesis will be useful for propellant applications because these propellants in general burn at a slow rate and provide sustained pressure in MPa range for few milliseconds. Propellant formulations that are currently being investigated contain metal oxide oxidizer and fuel nanoparticles that does not show sustained pressure characteristics. This thesis presents the results obtained with the nanoenergetic composites prepared using polymers, which exhibit the desired propellant characteristics.