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Advanced Nanomaterials and Energetic Application

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This edited volume brings together cutting-edge research and recent technological progress in innovative nanoenergetic materials, a rapidly evolving field at the intersection of chemistry, materials science, and propulsion engineering. The contributions highlight advanced developments in nano-sized metal fuels, combustion catalysts, oxidizers, thermites, and energetic composites, emphasizing their roles in ignition, combustion, and propulsion applications. Owing to their high heat of formation, large specific surface area, enhanced reactivity, and elevated energy density, nanoenergetic materials offer unprecedented opportunities for improving the performance of solid, liquid, gelled, hybrid, and electro-controlled propellant systems. Despite these advantages, achieving high combustion efficiency and stable industrial application remains a significant challenge. This volume presents both experimental and theoretical efforts aimed at understanding and optimizing the physicochemical processes governing preparation, reactivity, and combustion. It also underscores the dual scientific and engineering challenge of developing new nano-metric energetic ingredients while adapting propulsion technologies to their unique behaviors. By consolidating recent advances and identifying persisting obstacles related to safety, stability, and cost, this book provides a comprehensive overview of current achievements and future directions in nano-energetic materials for chemical propulsion. It serves as an essential reference for researchers, engineers, and practitioners seeking to advance next-generation energetic systems.



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