

New Avenues for Exploration and Applications of Gallium Nitride and related materials

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Gallium nitride, a wide-bandgap semiconductor compound, has in the last two decades registered a fascinating increase in the crystalline quality of epitaxial layers determining its leading role in the development of the modern solid-state lighting industry. The demonstration and successful commercialization of GaN-based blue light emitting diodes resulted in the physics Nobel prize to I. Akasaki, H. Amano and S. Nakamura in 2014. Exhibiting an impressive number of unique properties, over the last decade GaN has been remarkably successful in the area of high-power/high-frequency electronic applications and is now considered the second most important semiconductor material after Silicon. In this paper, we report on new fields of research and applications of gallium nitride and related materials such as nano-biomedicine, nano-microfluidics, nano-microrobotics and memristor networks. The feasibility of high-performance light-driven nano/microengines based on GaN nano/microtubular structures will be demonstrated.