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# Gallium Nitride

*Gallium nitride is probably the most important compound you've never heard of. A central component of modern consumer electronics, it also helps power military hardware.*

Gallium itself does not exist in pure form in nature—it is only found by extracting it from other materials such as zinc or aluminum. As a compound, however, with arsenic (GaAs) and especially nitrogen (GaN), gallium produces extremely useful semiconductors for a wide range of electronics.

If you have a Blue Ray disc player in your house, you already own some gallium nitride. The communications infrastructure that supports your 4GLTE cell phone also contains gallium nitride. And if you have a flat-screen LED television, that also has gallium nitride. As a component of lighting technology, GaN makes blue-green lasers and LEDs possible. Without this material, much of the current generation of high-end electronics wouldn't exist.

GaN and similar semiconductors are now considered essential components of military-grade electronics, providing warfighters with faster computer operations, more reliable communications systems, and improved sensor performance.

As a semiconductor material, GaN devices offer much greater energy efficiency than silicon, the previous industry standard. GaN transistors have roughly one-tenth the resistance of silicon-based transistors, allowing for much higher energy efficiency, faster switching frequency, and smaller power-electronic systems.

Getting to the point of making GaN into a useable material—for the Navy or the commercial world—took nearly 30 years of hard work by researchers in multiple countries, numerous wrong turns, and a tremendous amount of patience. And it all happened with the help of naval research. The creation of single crystal GaN films in the late 1960s, and the subsequent development of millimeter-wave GaN devices and amplifiers are products of ONR sponsorship.



Gallium nitride made the creation of blue-green lasers and LEDs possible—and consequently led to new electronics such as full-color LED televisions and Blu Ray DVDs.

(Photo courtesy of TopGaNLasers)