Laser Passivation of GaAs Surfaces

Silicon is a highly useful semiconductor, but, because of its indirect band gap structure, it is less efficient in radio frequency (RF) applications. Because of this limitation, III - V semiconductor compounds such as Gallium Arsenide (GaAs) are often used. However, GaAs does not produce a naturally-stable passivated surface. Industry therefore applies an external coat of an organic polymer to protect the surface of the GaAs. The polymer coating protects the surface of the GaAs, but at the same time generates a loss of efficiency, which then increases the voltage requirements and reduces the life of devices.

The challenge, therefore, is to passivate the material surface in such a way that does not lead to losses in the efficiency of GaAs RF devices.

University of Arkansas material scientists and electrical engineers have developed a method of passivating the surface of GaAs by using a femto-second UV pulsed laser. The laser passivates the surface of the GaAs by causing the semiconductor material to bond to itself. The process can be carried out in air ambient, hence eliminating the need for specialized vacuum requirements.
This contactless technology does not substantially disturb or alter the chemical and/or electronic properties of the material at or near the surface, nor does it introduce impurities. By eliminating the need for a polymer overcoat, GaAs devices such as battery-powered cell phones can operate at maximum efficiency and lifespan. This laser technique has been shown to remain stable for over a year

The patented laser passivation method is available for licensing. See recently published Patent No. 7,112,545 for more information.

ADVANTAGES

1. A surface treatment that maintains chemical and electronic integrity of material.

2. Reduced voltage and power requirements.

3. Cost and time savings associated with carrying out the process in ambient versus vacuum environment.

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