Resonant Tunneling Diode with High Peak Current Density

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a resonant tunneling diode that can be produced in a gallium arsenide material system for increased device performance.

OVERVIEW

Resonant tunneling diodes (RTDs) comprise semiconductor structures having two large band-gap barrier layers with a single low band-gap quantum well between them; they can be used for applications in circuits such as memory and logic devices. An InP material system has been used to produce RTDs; however, this method is not well suited for practical applications. Another material that has been considered is GaAs, but the RTDs that have been produced cannot reach the performances of InP-based devices. A new method for producing RTDs that achieve high performance standards is needed.

THE INVENTION

UW–Madison researchers have developed a resonant tunneling diode that can be produced in a gallium arsenide material system using processing techniques compatible with large scale production, particularly metal organic chemical vapor deposition. The multilayer RTD structure is grown on the surface of a nominally exact GaAs substrate and is formed of barrier layers of AlGaAs with a quantum well layer formed of low band-gap material (InGaAs) between the layers. The device is capable of achieving peak current densities at relatively low peak voltages and switching times of approximately one picosecond can be obtained.

APPLICATIONS

• Semiconductor devices, particularly resonant tunneling diodes

KEY BENEFITS

• Smooth interfaces between the various layers allow for high current density and other
desirable characteristics.
• Improved device performance

ADDITIONAL INFORMATION

Tech Fields
Semiconductors & Integrated Circuits - Design & fabrication
Semiconductors & Integrated Circuits - Components & materials

CONTACT INFORMATION

For current licensing status, please contact Scott Pollyea at spollyea@warf.org or 608-890-2930.