

Laser effect in electrically injected Tamm devices

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Rok wydania

2025

Czasopismo

Applied Physics Letters

Numer woluminu

127

Strony

151104/1-151104/4

DOI

10.1063/5.0300617

Kolekcja

Naukowa

Streszczenie

This work demonstrates the realization of an electrically driven Tamm laser diode based on the integration of a silver microdisk with a quantum-well-embedded distributed Bragg reflector (GaAs/AlAs). Tamm plasmon modes, confined at the interface between a silver film and a GaAs/AlAs distributed Bragg Reflector, enable surface-bound lasing with tailored spatial and spectral characteristics while preserving the integrity of the underlying semiconductor structure. The device comprises a patterned silver contact, enabling localized current injection into the active region formed by InGaAs quantum wells located at the maxima of the mode electric field. Under cryogenic conditions (95 K), the laser demonstrates a threshold current of 1.25 mA (4.4 kA/cm²), with a maximum emitted power of 200 μW at 906 nm. Spectral measurements reveal strong-to-weak coupling transition, the onset of optical gain, and mode confinement, culminating in lasing with angular and spectral narrowing. The emission properties are further validated by dispersion imaging, confirming lasing from the fundamental confined Tamm mode.

Słowa kluczowe

Semiconductor structures, Plasmons, Semiconductor materials, Emission spectroscopy, Optical properties, Quantum wells, Lasers

Adres publiczny

<http://dx.doi.org/10.1063/5.0300617>

Strona internetowa wydawcy

<https://www.aip.org/>

Język

Angielski

Typ publikacji

Artykuł

Plik został wygenerowany dnia 2026-10-09 06:57:00

Adres w repozytorium <https://old.chem.uni.wroc.pl/pl/repozytorium/Uz9ToTi>.