IDF INNOV

From invention to innovation

ALGAAS-ON-INSULATOR PLATFORM

Oxidation process to build a monolithic AlGaAs-on-Insulator platform useful for integrated lasers with low lasing threshold and for Surface Plasmonic Resonance (SPR) sensors.

Photonics ▪ Non linear optics ▪ Laser ▪ AlGaAs ▪ Insulator ▪ III-V semiconductors ▪ Monolithic platform

APPLICATIONS

- Lasers for Datacenters
- VCELS
- Surface Plasmon Resonance (SPR) sensors

PUBLICATIONS

- "Tuning second harmonic generation in AlGaAs nanodimers via non-radiative state optimization"
- "Role of the substrate in monolithic AlGaAs nonlinear nanoantennas"
- "Controlling SHG at the nanoscale with monolithic AlGaAs-on-AlOx antennas"
- "Polarization properties of second-harmonic generation in AlGaAs optical nanoantennas"
- "Monolithic AlGaAs second-harmonic nanoantennas"

INTELLECTUAL PROPERTY

PCT patent application
WO2017/140804A1 filed in 2017

CONTACT

Mail : bd-3S@idfinnov.com

Phone : +33(0)1.80.06.80.03

PRESENTATION

III-V semiconductors are a category of materials useful for optoelectronics applications, thanks to the physical properties of their crystalline structures. AlGaAs is one of them and has superior performances over silicon such as:

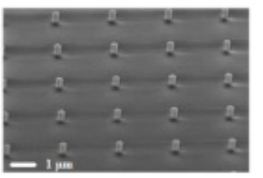
- No Two Photon Absorption @ 1.55 µm
- Direct laser emission
- Optical modulation at higher frequency rate.

The AlGaAs-on-Insulator plateform, which exhibits higher performances than SOI, was achieved thanks to a monolithic construction combining a high-contrast refractive-index ratio between the insulating layer and the AlGaAs waveguide.

Our invention deals with the monolithic fabrication of a thick layer of AlOx (>1µm), which plays the role of optical substrate and enhances the light confinement inside an AlGaAs heterostructure on top of it.

Our technology can first be used to develop Surface Plasmon Resonance (SPR) sensors based on a dielectric, instead of gold or silver, thus avoiding local heat peaks that can affect the sensitivity of the sensor. As a first proof of concept, frequency doubling has been demonstrated, with a conversion efficiency up to 5 orders of magnitude higher than the established record of second harmonic generation for plasmonic nanoantennas.

Our technology could also be used to design low lasing threshold and fast modulation laser, which would lead to decrease the electric consumption of lasers used for example in datacenters.



SEM images of AlGaAs nanodisks after oxidation of bottom AlAs layer
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COMPETITIVE ADVANTAGES

- Light confinement
- Low lasing threshold
- High modulation frequency
- High conversion rate for Second Harmonic Generation