Dry Etching of High [Al] AlGaAsSb Compounds Using Cl₂ /N₂ /Ar ICP RIE

Brice Adelin, Quentin Gaimard, Alexandre Larrue, Aurélie Lecestre, Pascal Dubreuil, Yves Rouillard, Guilhem Boissier, Aurore Vicet, Antoine Monmayrant, Olivier Gauthier-Lafaye

To cite this version:

Brice Adelin, Quentin Gaimard, Alexandre Larrue, Aurélie Lecestre, Pascal Dubreuil, et al.. Dry Etching of High [Al] AlGaAsSb Compounds Using Cl₂ /N₂ /Ar ICP RIE. International Conference on Micro and Nano Engineering (MNE) 2014, Sep 2014, Lausanne, Switzerland. hal-01102417

HAL Id: hal-01102417
https://hal.archives-ouvertes.fr/hal-01102417

Submitted on 12 Jan 2015

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers. L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
GaSb based compound semiconductors emit in the mid-infrared range and present extremely good opto-electronic properties, with demonstrated bipolar laser diodes emitting from 2 to 3.5 µm with good performances. One key challenge remaining is the realization of high performance single mode emitters to enable the realization of efficient trace gas detection systems. Such diodes are often made with a core waveguide embedded in claddings made of AlGaAsSb with high Al content. Deep etching of high Al content claddings is known to be a particular challenge for deep etching with high aspect ratio, and restricts the designs achievable for laser diodes fabrication.

We present our work on deep etching of sub-micron 1D and 2D periodic structures designed to achieve DFB effect in edge emitting mid infrared lasers. DFB cavities can be realized using several geometries. We investigated two thoroughly opposite ones. The first studied geometry relies on periodic modulation of a waveguide width, and requires smooth etching of narrow 1D trenches with a mostly open etch mask. The other investigated geometry relies on 2D photonic crystal cavities, and requires deep etching of sub-micron diameter holes with high aspect ratios, in a mostly closed mask.

**Dry etching of high Al content AlGaAsSb compounds using Cl₂/N₂/Ar ICP RIE**

**Acknowledgments:** This work was supported by the French National Research Agency (ANR) under Grant ANR-2011-NANO-028 01 (ANR MIDAS).