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 AlGaAs 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 for several geometries. We investigated two thoroughly opposite ones. The first studied geometry relies on periodic modulation of the 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.

Deep dry etching of shallow features in high Al content AlGaAsSb can be achieved using Cl2/N2/Ar chemistries. Good performances are achieved provided that the etching is performed using high aspect ratio deep etching processes 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.

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