Introduction

- **Etching system:** Unaxis ICP RIE
- **Process characteristics:** high plasma density, low process pressure, high etch rate, good etch uniformity, and low energy ion damage
- **Process temperature:** 15 – 200 ºC
- **Sample size:** 6” or smaller
- **Available gases:** HBr, Cl2, BCl3, CH4, H2, Ar, N2, and O2
- **~ 2 minutes sample loading & unloading time**
- **Computer controlled operation**

Substrate: GaAs Nanotrenches
Chemistry: BCl3, Ar, N2
Mask: PMMA
Selectivity: 1.22
Etch rate: 0.5 um/min

This process was used to etch nano-trenches and holes and resulted in clean & smooth etch surface, good selectivity to PMMA, and 85 degree side wall.

Substrate: GaAs Micro-trenches
Chemistry: BCl3, Cl2
Mask: Shipley S18xx photoresist
Selectivity: 3.2
Etch rate: 0.8 um/min

clean & smooth etch surface, 85degree side wall angle, good selectivity to photo resist

Substrate: InP
Chemistry: HBr, N2
Mask: SU8, Si3N4
Selectivity: > 2:1
Etch rate: ~ 2.0 um/min

clean & smooth etch surface, 10 – 15 um deep etch, vertical side wall, greater than 10:1 selectivity to Si3N4 or SU-8

Substrate: AlGaAs
Chemistry: BCl3, Cl2
Mask: Shipley S18xx
Selectivity: > 3:1
Etch rate: 0.7 um/min

clean & smooth etch surface, > 85degree side wall angle, good selectivity to photo resist

Substrate: InP/(AlInAs-GaInAs multi-layers)/InP
Chemistry: HBr, N2
Mask: SU-8
Selectivity: > 10:1
Etch rate: ~ 2.0 um/min

This process resulted in uniform etching along the depth for different materials. For multi-layer-different materials etching, the big challenge is the jags or roughness along the sidewall caused by selective etching or varying lateral etch rates of different materials. This process overcomes this problem and also demonstrated clean & smooth etch surface.

Available for general use
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