IMPACT OF THE PRESENCE OF SILICON ON INP CHLORINE BASED PLASMA ETCHING

Katarzyna Stokeley[1], Kevin Powell[1]
[1] Oxford Instruments Plasma Technology

As InP based optoelectronic device consumption increases and wafer sizes grow, there are challenges in porting batch processes over to single wafer platforms, whilst keeping the most desired properties of laser structures: vertical sidewalls, smooth profile and low microtrenching. In this study we optimized Cl2 based plasma etching of InP using an OIPT PlasmaPro100 Cobra300 system equipped with a heated electrostatic clamp.

A process was obtained with smoothly etched sidewalls, high etch rate 738nm/min, vertical profile of 89.5deg but with a microtrench 9.7% of the etch depth. Experimentation adding silicon into the etch chemistry in controlled ratios was able to remove the mictrotrench, whilst retaining smooth sidewalls and positive profile of 91.1deg (Fig 1). Here the Si was from a sacrificial source on the electrode shield. The etch rate was initially reduced by c.50%, based on the previous best process, but was recovered by adjustments to the shield geometry.

Using silicon in this way in the process chamber is an easy way to achieve InP laser structures, like smooth sidewalls, vertical profile and low microtrenching. This method is therefore very attractive for high volume manufacture of high quality optoelectronic devices on directly clamped wafers.