

Chapter 7

Applications of the Shadow Mask Technique

Shadow mask is a novel technique for MBE selective epitaxy growth. Usually for the optoelectronic devices fabrication. Mesa form of the devices could be directly grown onto the substrates without any mesa etching procedure after. The shadow mask pattern is flexible to prepared with any shape. Figure 7.1 shows a possibility to use shadow mask for growing array of dot pattern of GaAs on Si substrate.

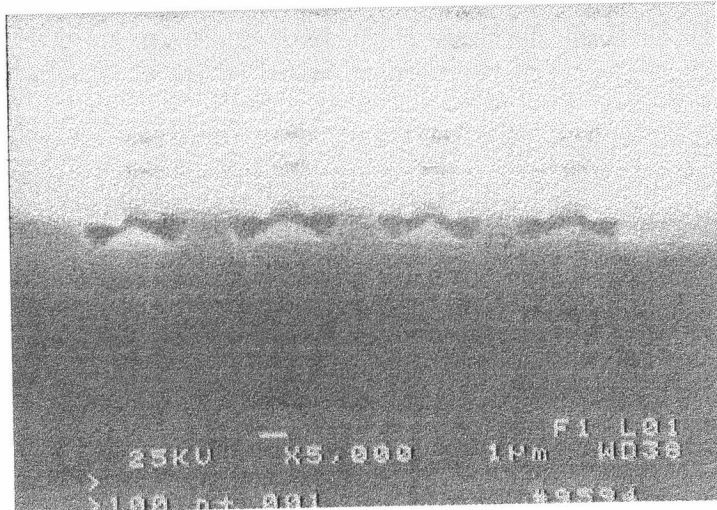


Figure 7.1 Array of dot pattern of GaAs on Si using shadow mask.

Not only GaAs-on-Si system but also GaAs-on-GaAs system that can be gained from the shadow mask technique. Laser diodes, Optical switches, Optical modulators, Optical waveguides are the examples for applying the shadow mask technique in the fabrication processes. In gain-guide laser diode structure, the width of the optical mode along the junction plane is mainly determined by the width of the optical gain region, which in turn is determined by the width of the current-pumped region (typically in the range of 5-10 μm) [29]. This is then the reason for preparing the mesa structure of the laser diodes. The shadow mask technique shows a figure of merit to produce *in-grown* mesa structure without mesa etching procedure.

Figure 7.2 is SEM micrograph of the X-pattern shadow masks that were prepared on the GaAs substrate. These X-pattern are the basically structure for Optical switch/modulator devices. It is noted that the mask cantilever should be designed with consideration of the spacer which is etched under the mask layer to leave the area of selective growth. The cantilever is proved for mechanically strong enough for the weight of the device structure.

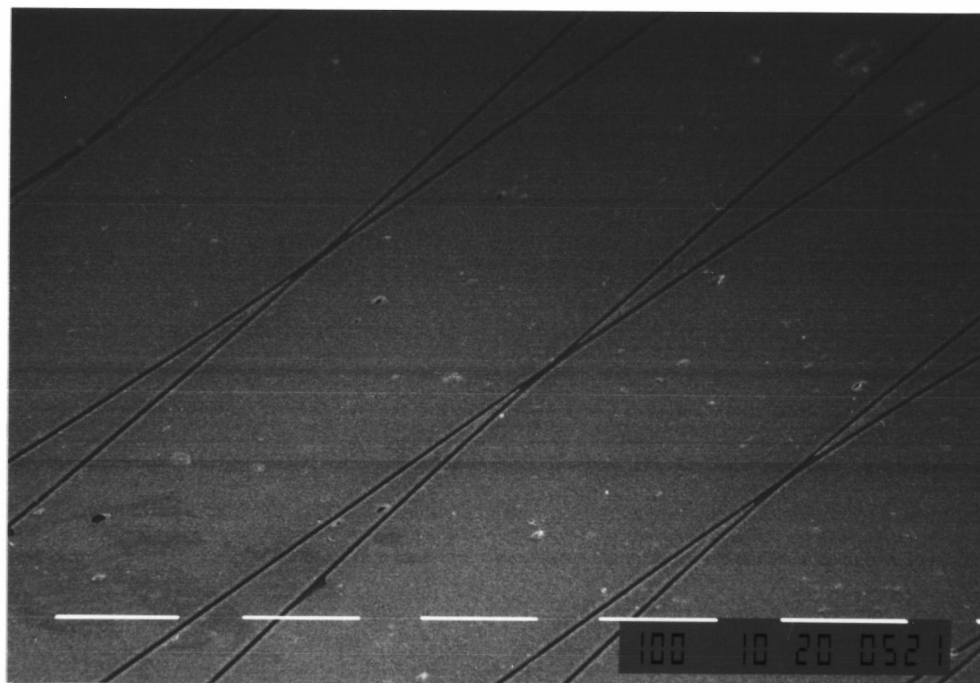


Figure 7.2 SEM picture of X-pattern GaAs/AlGaAs shadow mask.