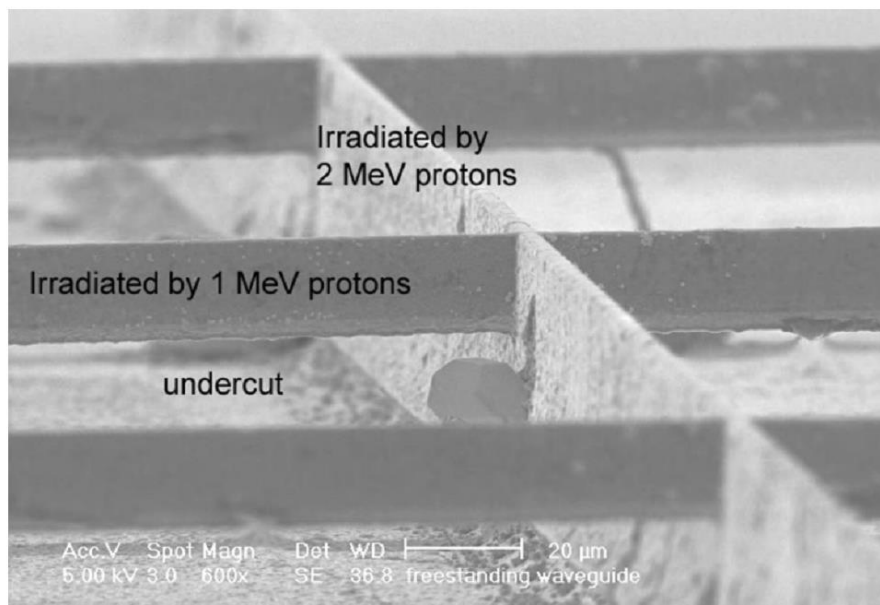
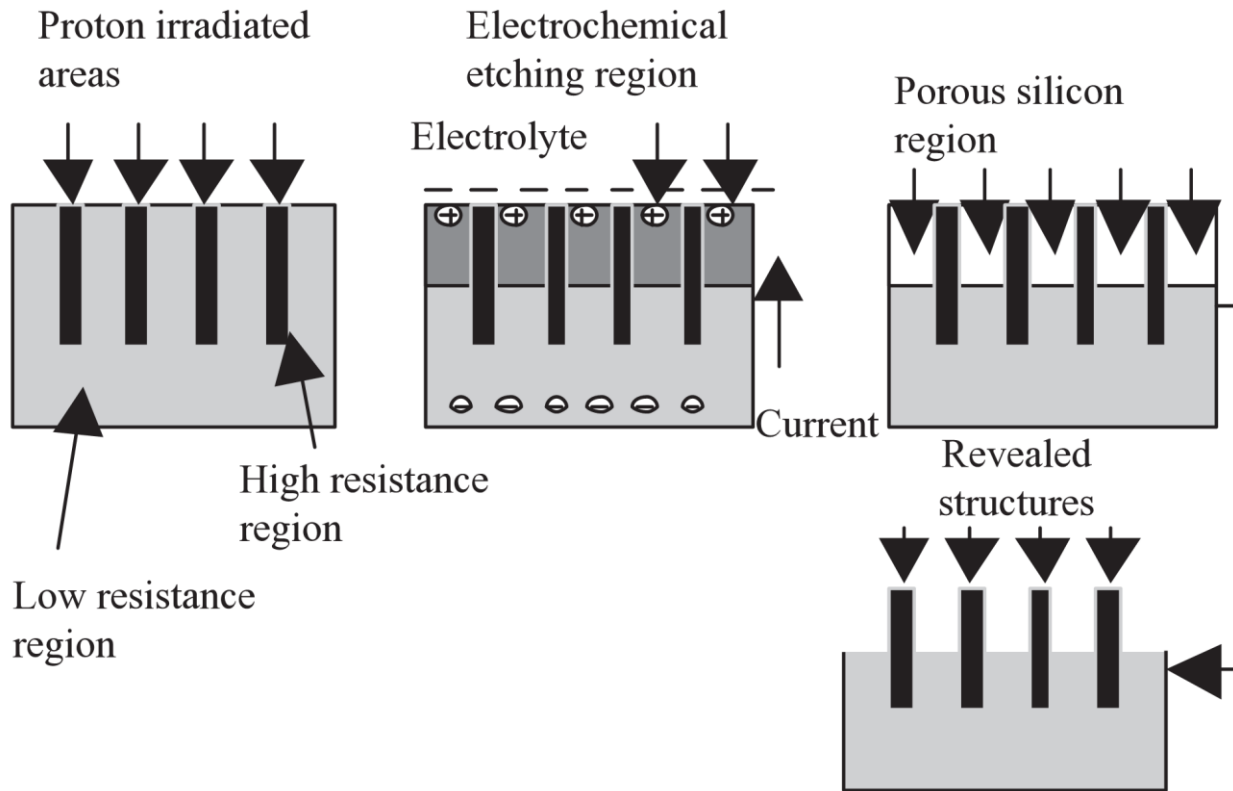


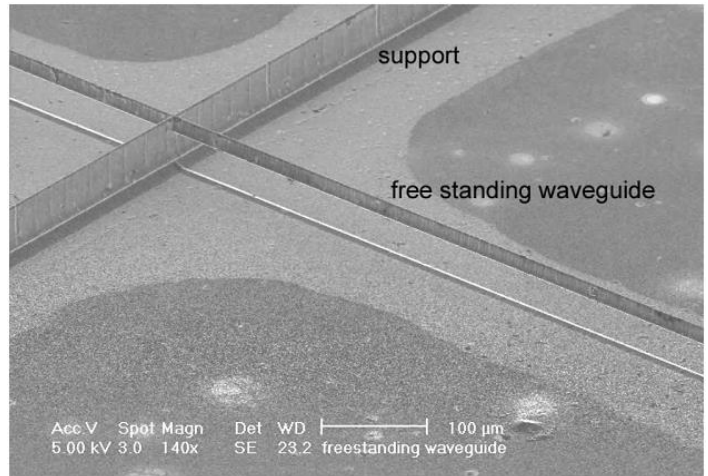
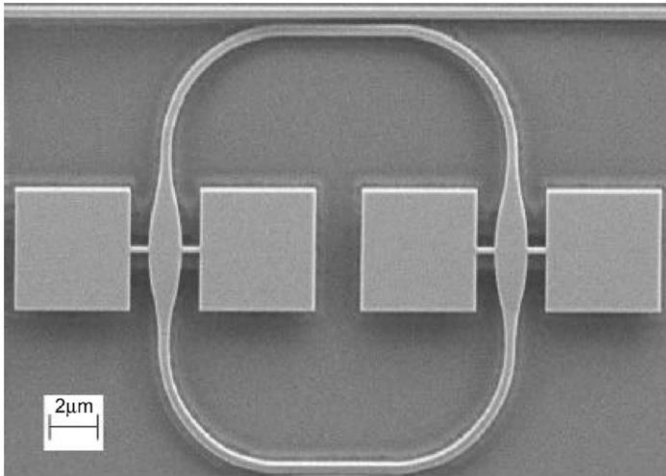
# Novel Silicon Waveguides:

a) Free Standing (3D) structure:

Fabrication Process:

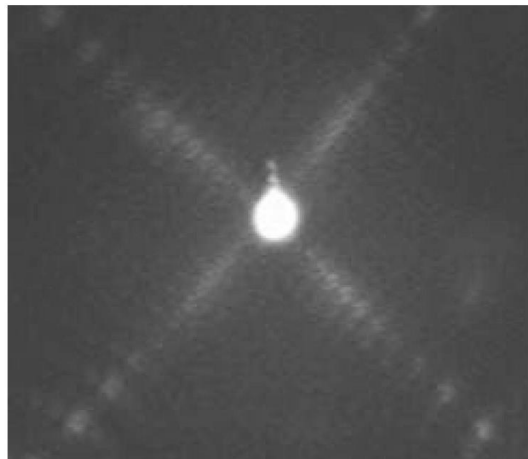


## Examples and typical loss values:



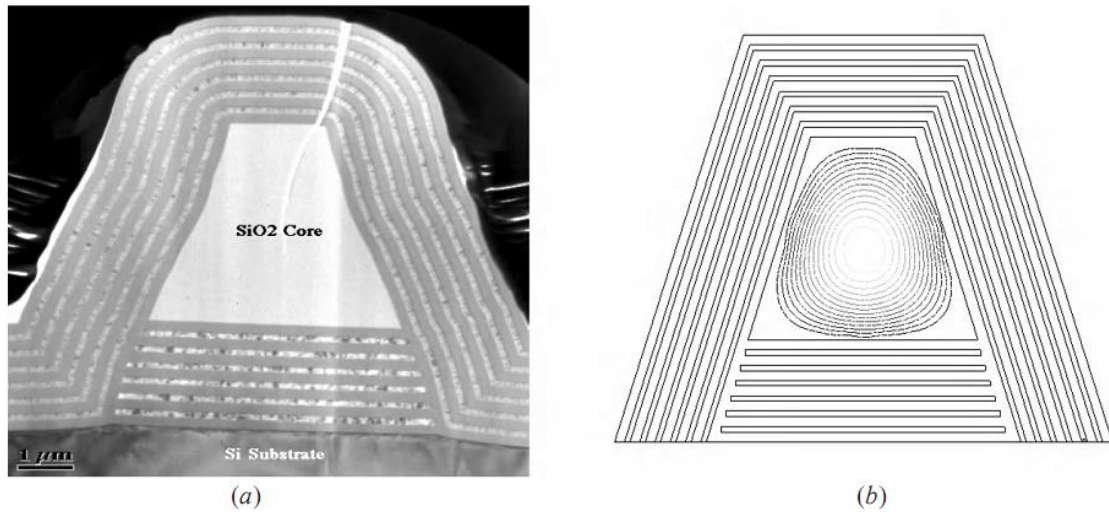
Quality factor of 15000 for ring resonator and propagation loss values of  $13.4 \pm 0.7$  dB/cm for TE and  $14.6 \pm 0.6$  dB/cm for TM polarised light are reported in: P. Y. Yang, et al, Appl. Phys. Lett., 90, 2007, 241109.

## Field profile:



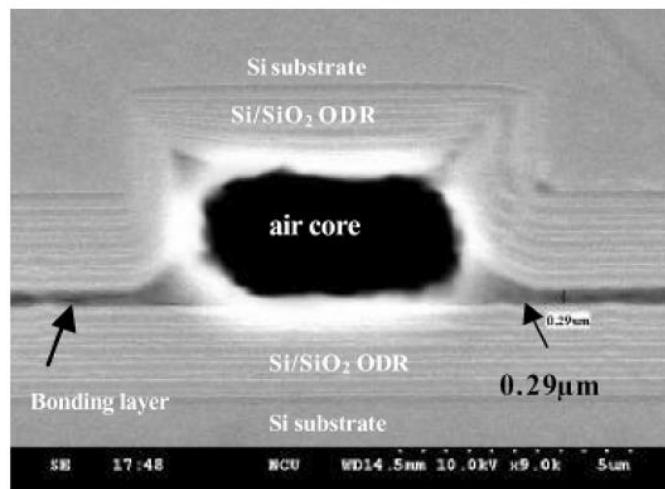
## b) Hollow Waveguides:

PECVD based multilayer fabrication: minimum propagation loss 6 dB/cm



**Figure 2.29** (a) TEM image of the Bragg cladded channel waveguide [61]; (b) mode profile for trapezoidal shape omnidirectional waveguide with SiO<sub>2</sub> core and Bragg mirror made of six Si/Si<sub>3</sub>N<sub>4</sub> double layers [63]

Wafer Bonding fabrication: minimum propagation loss  $1 \pm 0.5$  dB/cm



**Figure 2.32** SEM image of the cross-section of the hollow waveguide fabricated by wafer bonding [64]

## Fabrication:

The trench was defined and etched via photolithography and inductive coupled plasma (ICP) etching. Six Si/SiO<sub>2</sub> bi-layers were then deposited by PECVD on the trenched silicon wafer and another blank silicon wafer. The thicknesses of the Si and SiO<sub>2</sub> layers were 111 nm and 258 nm, respectively. A 2% dilute KOH solution was then applied, before pre-bonding at a temperature of 70° C for 10 min. Finally, the pre-bonded wafer was annealed at 200° C for 2 h.