

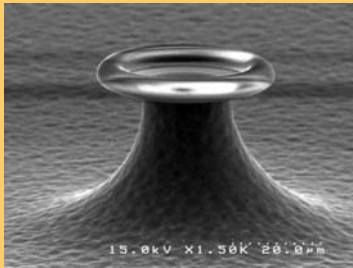
Planar optical amplifier



- Erbium doped Al_2O_3 ridge waveguide on SiO_2/Si
- Gain: 2.3 dB
- Signal: 1535 nm
- Pump: 1480 nm GaAlAsP pump laser
- Pump power: 10 mW
- Gain threshold: 4 mW
- Amplifier spiral area: 1 mm^2
- On chip WDM multiplexers

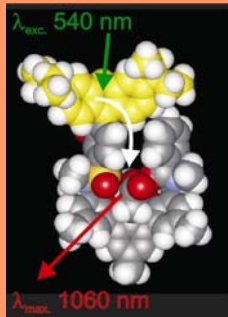


Si-based microcavity laser



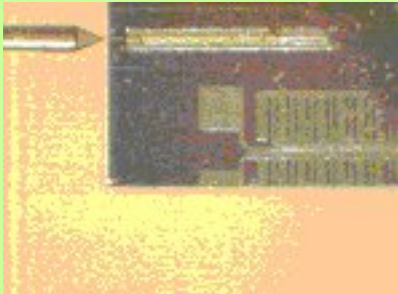
- Erbium doped SiO_2 ring resonator
- Operating wavelength 1.55 1.60 μm
- Pump: 1480 nm external cavity laser
- Lasing threshold 2.5 μW
- Output power: 50 nW
- Cavity diameter: 50 μm , cavity Q: 4×10^7
- All CMOS fabrication process

Polymer infrared LED



- Nd-doped lissamine complex polymer diode
- Operating wavelength: $1.1 \mu\text{m}$
- External emission efficiency: 1×10^{-4}

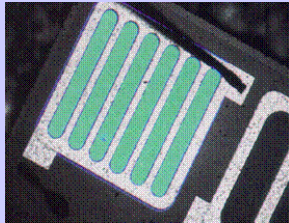
Si:Er infrared detector



- Er doped Si *p-n* waveguide Si
- Operating wavelength 1.45 1.60 μm
- Detection efficiency: 1×10^{-4}
- Waveguide length: 3 mm
- All CMOS fabrication process
- Er \rightarrow Si energy backtransfer efficiency: 70 %



Si:Er infrared LED



- Erbium doped Si *p-n* diode
- Operating wavelength 1.45 1.60 μm
- Output power: μW
- Modulation speed: 10 kHz
- External emission efficiency: 1×10^{-4}
- All CMOS fabrication process



Ultra-shallow junction Si solar cell

- Si p - n diode, B, P implanted
- AM1.5 efficiency: 10 %
- Shallow junction by pulsed laser annealing



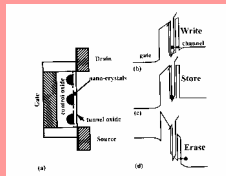
MeV ion beam technology



- 1 MV heavy-ion van de Graaff accelerator
- 2 MV Van de Graaff RBS accelerator
- Ion source exchange system
- X-ray suppression
- High voltage stabilizer



Silicon nanocrystal non-volatile memory



- Charge storage in Si nanocrystals
- Ion implanted Si nanocrystals
- Passivation, size control
- Device demonstration
- Wafers processed in INTEL process line

