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Title:Raman Scattering and gain in Silicon-on-insulator Nanowire Waveguides
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Abstract:Raman scattering in air-covered and SiO₂-covered Silicon-on-insulator waveguides of 1.25 cm length, 220 nm height and two widths of 2 μm or 0.45 μm was investigated. A continuous wave (CW) Raman fiber laser at 1454.8 nm with linewidth of <0.1 nm was used as a pump source. The coupling efficiency was estimated to be around 10% for one end facet. Spontaneous Raman shift of 521 cm⁻¹ (1574.2 THz) scattering was observed at 1573.8 nm for SOI waveguides in air and 1574.2 nm for waveguides covered with SiO₂ at pump power of <1.5 mW inside both waveguides of 2 and 0.45 μm. Anti-Stokes scattering was observed at 1352.8 nm with pump power of 16 mW. The stimulated Raman gain was calculated from spontaneous Raman efficiency. Total Raman on-off gain was determined to be 0.6 dB for waveguide with width of 2 μm and 1 dB for waveguide with width of 0.45 μm.
Number of references:20
Inspec controlled terms:elemental semiconductors - fibre lasers - nanowires - optical waveguides - Raman lasers - Raman spectra - silicon - silicon compounds - silicon-on-insulator
Uncontrolled terms:Raman scattering - silicon-on-insulator nanowire waveguides - air-covered - continuous wave Raman fiber laser - pump source - spontaneous Raman shift - anti-Stokes scattering - stimulated Raman gain - Raman on-off gain - size 1.25 cm - size 220 nm - size 2 mum - size 0.45 mum - wavelength 1454.8 nm - frequency 1574.2 THz - wavelength 1573.8 nm - wavelength 1574.2 nm - power 1.5 mW - wavelength 1352.8 nm - power 16 mW - SiO₂
Inspec classification codes:A4280L Optical waveguides and couplers - A7830 Infrared and Raman spectra and scattering (condensed matter) - A4255N Fibre lasers and amplifiers - B4130 Optical waveguides - B4320F Fibre lasers and amplifiers
Numerical data indexing:size 1.25E-02 m;size 2.2E-07 m;size 2.0E-06 m;size 4.5E-07

m;wavelength 1.4548E-06 m;frequency 1.5742E+15 Hz;wavelength 1.5738E-06 m;wavelength 1.5742E-06 m;power 1.5E-03 W;wavelength 1.3528E-06 m;power 1.6E-02 W
Chemical indexing:SiO2/bin O2/bin Si/bin O/bin
Treatment:Practical (PRA)
Discipline:Physics (A); Electrical/Electronic engineering (B)
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