

Semiconductor Device of Tapered Waveguide for Broadband Optical Communications

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Abstract : To expand the optical spectrum for use in broadband optical communications, we study the properties of a semiconductor waveguide device with a tapered structure including its third-order optical nonlinearity. Spectral-broadened output by the tapered structure has the potential to create a compact, built-in device for optical communications. Here we deal with a compound semiconductor waveguide, the material of which is the same as that of laser diodes used in the communication systems, i.e., $\text{In}_x\text{Ga}_{1-x}\text{As}_y\text{P}_{1-y}$, which has large optical nonlinearity. We confirm that our structure widens the output spectrum sufficiently by controlling its taper form factor while utilizing the large nonlinear refraction of $\text{In}_x\text{Ga}_{1-x}\text{As}_y\text{P}_{1-y}$. We also examine the taper effect for nonlinear optical loss.

Keywords : $\text{In}_x\text{Ga}_{1-x}\text{As}_y\text{P}_{1-y}$, waveguide, nonlinear refraction, spectral spreading, taper device

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