Control of Photoluminescence Polarization of InAs Nanowire Quantum Dot Using Phase Change Material

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ABSTRACT

On-demand control of photoemission properties, particularly polarization, of quantum nanostructures is a fundamental requirement for realization of optoelectronic integrated devices. For hybridization of optical and electronic devices, monolithic combination of III-V nanostructures with a high quantum yeild and matured silicon integrated circuits is most promising. Photoluminescence (PL) properties from quantum dots (QDs) can be largely modified by embedding the QD in a nanowire, which supports propagation modes of PL in one-dimensional direction. In this study we discuss the possibility of PL polarization control of InAs QD/ InP nanowire by modifying the effective diameter of nanowire by using the change in refractive index of GeSbTe (GST).

To design the length and diameter of GST/InP nanowire, a FDTD electromagnetic simulation was performed. We find that a switching between x-polarized and y-polarized PL can be achieved at an optimum condition. An experimental demonstration of PL switching based on single QD spectroscopy will be also presented.

Key words: Quantum dot, nanowire, photoluminescence, polarization