

## Observation of optical anisotropy of GaAsSb-capped InAs quantum dots

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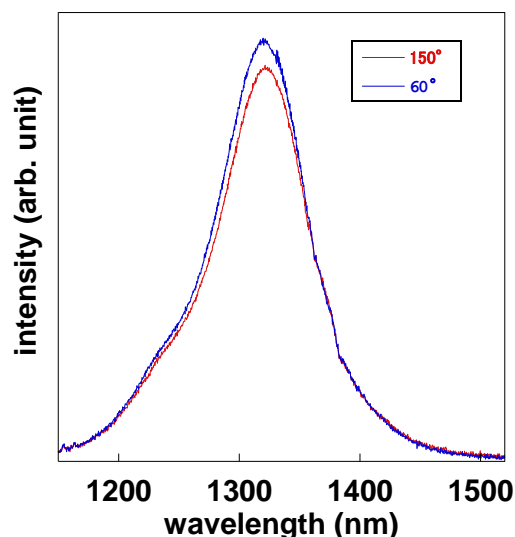
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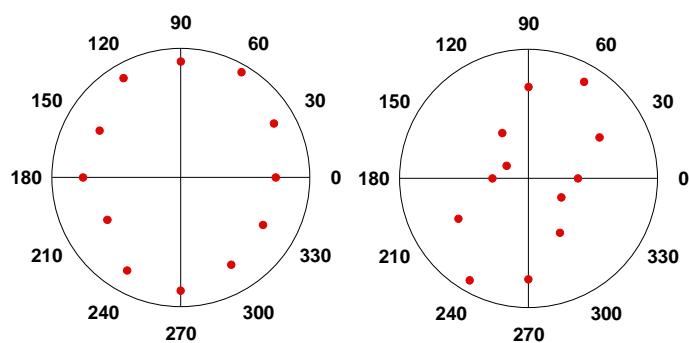
Self-Assembled InAs Quantum Dots grown on GaAs substrates satisfy the qualitative requirement for photonic devices such as laser diode.<sup>1</sup> And QDs formed by Strasky-Krastanov (SK) growth mode show a broad photoluminescence (PL) spectrum and in-plane asymmetries of dot shape and distribution of strain due to the nonuniformity of its size.<sup>2</sup> In this study, we report the optical anisotropy of InAs QDs capped by GaAs<sub>1-x</sub>Sb whose composition of Sb is different. GaAsSb cap layers allow the excitation wavelength of InAs QDs to be extended to the 1.55  $\mu\text{m}$  region.<sup>3</sup> We observed optical anisotropy of these samples at ground state by PL measurement.

The samples are InAs QDs capped by GaAsSb grown on a GaAs substrate by molecular beam epitaxy. The composition of Sb is 15% and 25%. We use the He-Ne laser as a light source whose excitation wavelength is 632.8 nm. The temperature of samples was set to 13 K. The degree of linear polarization (DLP) of the PL spectrum was measured by a set of a rotating half-wave plate and a fixed polarizer.<sup>4</sup>

As shown in Fig. 1, for the PL spectrum of 15%-Sb sample, red and blue curves are related to the polarization ingredients which are orthogonal to each other. The difference of two curves shows clearly the presence of optical anisotropy. Figure 2 and Fig. 3 are the polar plot of the polarized photoluminescence intensity as a function of the polarizer angle<sup>5</sup> of both samples. The 25%-Sb sample shows stronger optical anisotropy than 15%-Sb sample. We evaluated the DLP which is defined as  $P = (I_{\text{max}} - I_{\text{min}}) / (I_{\text{max}} + I_{\text{min}})$ . The DLP of samples with 15%-Sb and 25%-Sb are 3.4% and 11.7%, respectively. This result shows that the DLP becomes larger for the higher Sb content.



**Fig 1.** PL spectra of GaAsSb (15%-Sb) capped InAs QDs at 60° (red line) and 150° (blue line).



**Fig 2.** DLP dependence of the PL intensity in 15%-Sb content sample **Fig 3.** DLP dependence of the PL intensity of 25%-Sb content sample

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