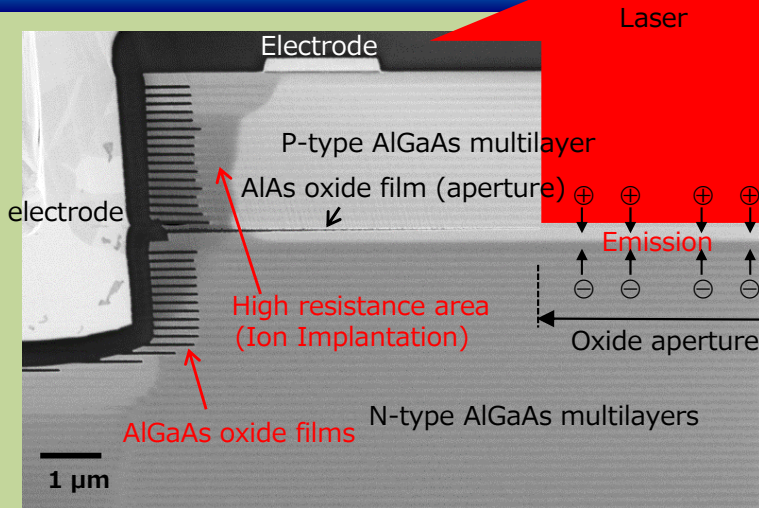


Evaluation of carrier and resistance distribution of VCSEL

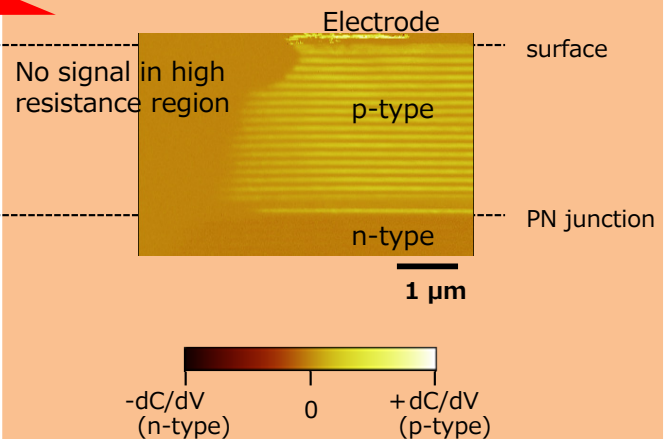
Vertical Cavity Surface Emitting Laser (VCSEL) has been attracting attention as a laser light source for sensing applications. We present typical case studies for the evaluation of carrier and resistivity distribution in a commercial VCSEL using low-voltage SEM, SCM and SSRM.

1. Low-voltage SEM observation



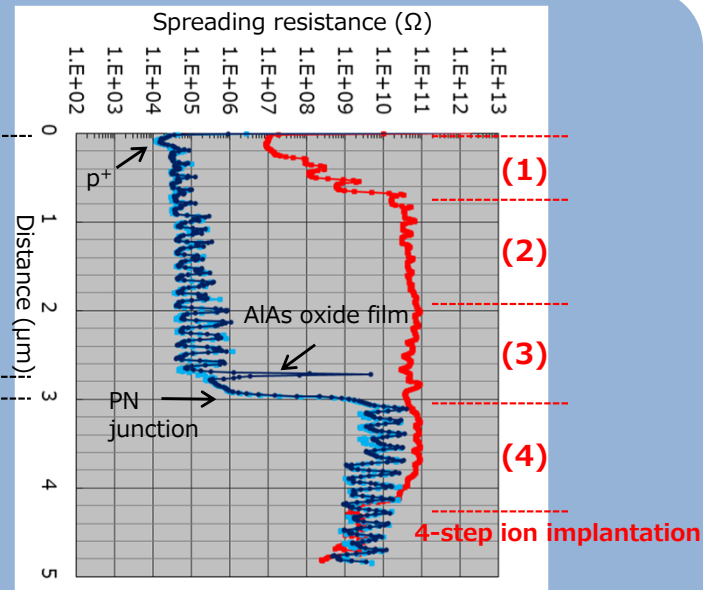
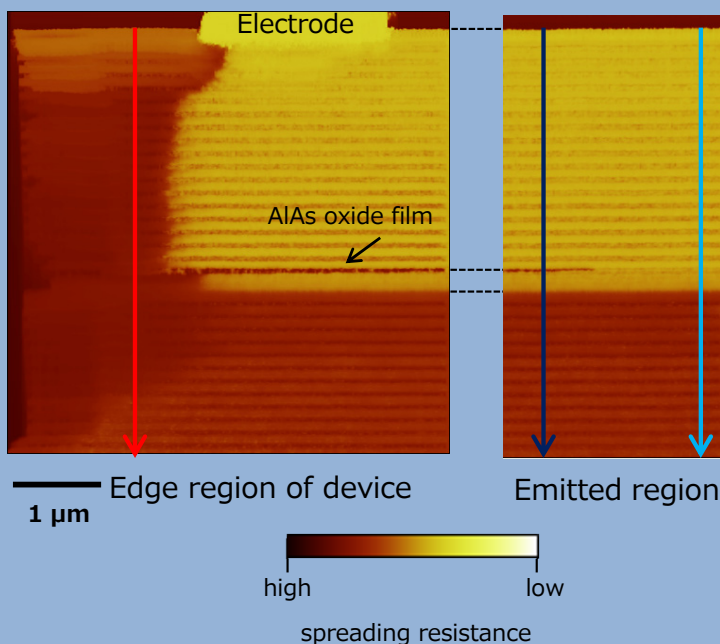
Visualization of carrier type differences. High resistivity area and insulated films at the edge area.

2. Identification of carrier type by SCM



Identification of p/n types. Visualization of high-resistance area.

3. Evaluation of spreading resistance by SSRM



Spreading resistance profile

*Positive bias is applied to the sample side. The N-region measured higher than actual resistance due to bias (direction)-dependence.

Resistance distribution in semiconductor over a wide range from ohmic contact to high resistance. Highly resistance area by 4-step ion implantation at the edge of the device.

Low-voltage SEM, SCM and SSRM can evaluate the p/n junction, oxide aperture and shape of high-resistance regions of VCSEL. We provide helpful information that contributes to solving various problems.