

Capacitance Measurement for Electron Transport Characterization

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The interest for electron transport has been substantially grown during last decade. Several spectroscopic techniques have been used in the characterization of electron transport. Especially, the electron transport mechanism on epitaxially grown layer has special attention, because of its possible application in semiconductor device. However, many experimental techniques have definite limitation in spatial resolving power. On the other hand, the requirement for spatial resolution is growing up, in relation of the scale-down of semiconductor device. There is one technique with spatial resolution, which is ballistic electron emission spectroscopy(BEES). But, this is very difficult for data acquisition. So, its S/N ratio is rather poor, comparing to other conventional spectroscopic techniques.

We made the capacitance measurement facility. This capacitance measurement method used the phase lock loop(PLL). We used the AC modulation signal with > 10 Mhz and the amplitude of ~ 50 mV. The AC modulated signal activated the LC oscillator, in which C was consisted of the specimen, matching capacitor and stray capacitance. This LC resonant signal was followed by the phase detection circuit and feedback loop for stable measurement. From this method, the capacitance measuring resolution is much enhanced. Therefore, this capacitance measurement technique can be used in the electronic characterization, especially for the small area.