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NEW FAST METHOD FOR READING CHARGE BIT STORED IN MNOSFET

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The reading of data in nonvolatile memory elements can be achieved by using scanning microscopy. Though the scanning microscopy has high spatial resolution, they have sufficient lack for application that is connected with the scan (or reading) speed. For them, the scan rate is limited by the feedback response time. Besides, almost all the scanning microscopes have expensive and complex electromechanical components to move tip or sample and optical systems (laser, photodetector) for registration. In this work with using simulation, it is investigated the possibility to detect (to read) localised charge (charge bit) trapped in metal-nitride-oxide-semiconductor field effect transistor (MNOSFET), without using the movable probe, by applying scanning voltage to source-base (or drain-base) transition. It allows to reach enough reading rate. At applying saw-tooth sweep voltage, the scan rate depend on the period of sawtooth voltage. The trapped localized charge affect to capacitance of the lateral source-substrate (or drain-substrate) transition of MNOSFET. This effect is shown as a jump of the capacitance in the lateral C-V dependence (Fig.1a). To experimental determination, the jump voltage (V_{jump}), it is expedient to calculate the derivative of the change of the capacitance with respect to the bias voltage (V_{bias}), d(C)/dV, at all voltages along voltage axis of the C-V dependence. In this derivative, the V_{jump} will be reflected as voltage corresponding to an extreme point of the derivative curves (Fig.1b). The Vjump strongly depends on position and linear size of charge bit as well as on substrate doping concentration. At appropriate conditions, the applying of the saw-tooth voltage may be used as scanning to read bit information saved in the form of localized charge trapped in silicon nitride layer. In this case, for example, the channel of transistor can be considered as word line in random access read only nonvolatile memory element

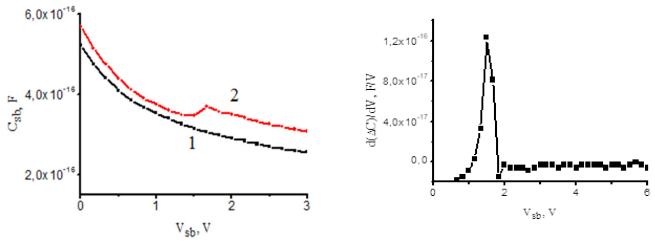

Figure 1: (a) C-V dependence of the source-base transition without (1) and with (2) localised charge embedded in silicon nitride layer of MNOSFET and (b) derivative d(□C)/dV

Biography

Atabek E Atamuratov has completed his Specialist Diploma in Physics in 1983 from Moscow State University and PhD from Uzbek National University in 1993. He is the Docent of Physics department of Urganch State University. He has published more than 15 papers in reputed journals. He is Reviewer of *International Journal of Electronics*. At Urganch State University, he leads the group of electronics and modelling of semiconductor devices. The group has several national and international research projects. He is an Advisor for 2 PhD students and 5 MS student at the Physics department of Urganch State University.

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