学术报告

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The fine processing scale for conventional semiconductor devices will reach the atomic scale in near future. It is evident that not only the limits to conventional fine processing technology but also the physical operating limits of semiconductor devices are being reached. One possible way to overcome these technological and physical limits is to achieve breakthroughs in device materials and device-operation principle using nanotechnology. A promising type of such nano-devices is the nano-ionic device, which is operated by controlling the local ion migration and electrochemical reaction instead of electron and hole migration. The nano-ionic device can be expected high performance and novel functionality which are not obtained by the conventional semiconductor device. In this presentation, we will introduce ways to control the local ion migration and electrochemical reaction at hetero-interfaces. Furthermore, the unique physical and chemical phenomena and functions caused by these controlling in order to fabricate novel nano- ionic devices are demonstrated.

We have fabricated two-/three-terminal nanoionic devices with simple stacked layers, such as metallic oxide or graphene oxide/ionic conductor layers, in which the migration of oxygen/hydrogen ion and redox reaction can be occurred at interfaces by applying bias voltage. By tuning Quantum point contact, Schottkey-like barrier, electric double layer or electrochemical reaction using the local ion migration at the interface, useful electrical and optical functions, such as rectification, atomic switching, artificial neuron, photoluminescence and so on, are obtained in these devices[1-5].

References

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