

電界放射電流誘起型EMによる単電子トランジスタの集積化の検討

Integration of Single-Electron Transistors Using Field-Emission-Induced Electromigration



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Introduction: Field-Emission-Induced Electromigration (Activation)

Activation: Electromigration Method Induced by Field-Emission Current Passing Through The Nanogaps

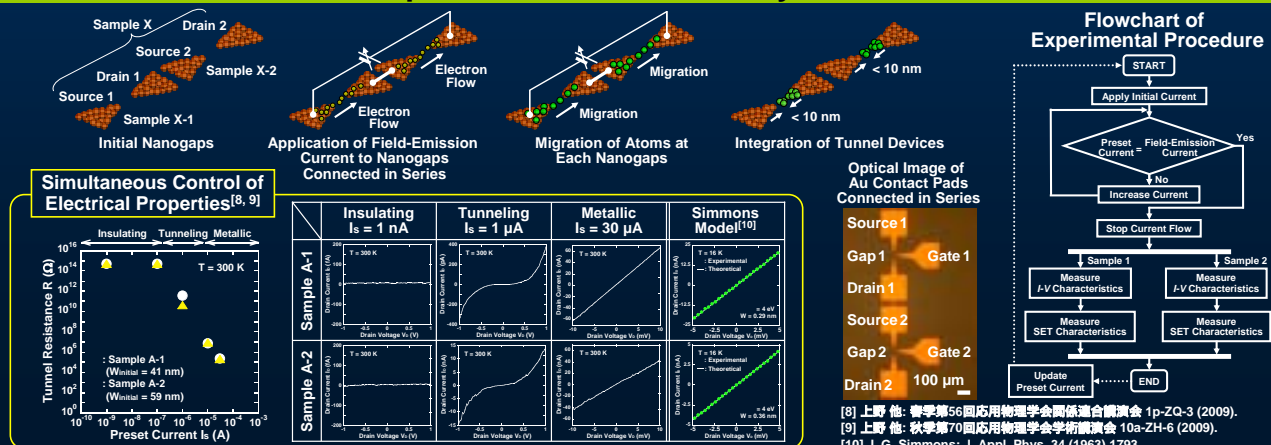
Simple and Easy Fabrication Technique of Tunnel Devices

- ✓ Wide-Range Control of Tunnel Resistance of Nanogaps^[1-3]
- ✓ Magnetoresistance Properties of Ni/Vacuum/Ni System^[4, 5]
- ✓ Simple and Easy Fabrication of Single-Electron Transistors (SETs)^[6, 7]

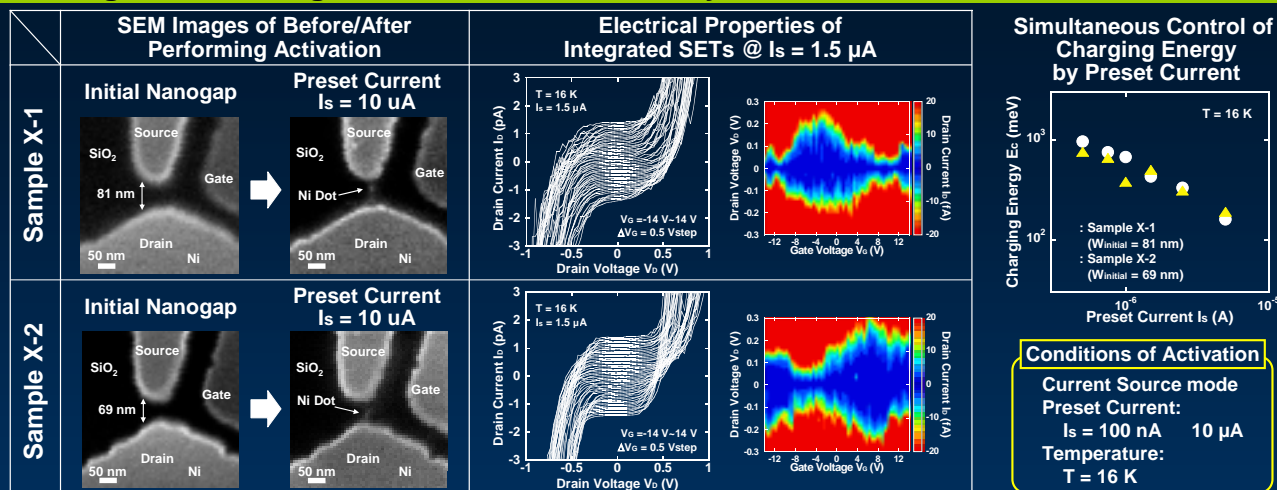
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Control of Electrical Properties of Tunnel Devices by Only Adjusting Applied Current During Activation

Control of Electrical Properties of Simultaneously Activated Tunnel Devices



Integration of Single-Electron Transistors by Activation



Conclusion

- ✓ **Simultaneous Control of Tunnel Resistance of Two Nanogaps by Preset Current**
 - Tunnel Resistance R: 100 T 1 M (Preset Current I_s : 1 nA $30 \mu\text{A}$)
- ✓ **Controlled Fabrication of SETs Using Field-Emission-Induced Electromigration (Activation)**
 - Fabrication of SETs with Single or Multi Island Using Activation
 - Control of Charging Energy of SETs by Preset Current
- ✓ **Integration of SETs Using Field-Emission-Induced Electromigration (Activation)**
 - Coulomb Blockade Voltage of Each Device was Obviously Modulated by The Gate Voltage @ 16 K
- ✓ **Simultaneous Control of Charging Energy of Integrated SETs by Preset Current**
 - The Charging Energy of Both SETs Decreased Simultaneously with Increasing The Preset Current @ 16 K