

NOVEL TRANSPORT PROPERTIES IN QUANTUM CONFINED SILICON CHANNELS AT LOW TEMPERATURES

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Scaling of Si technologies is still continuing, and the minimum feature size is around 10-nm, in which various quantum confined effects are expected. We are fabricating various nano-structures, such as quantum dots, fins, quantum wells, nano-wires by advanced Si processes for applications in electronics and photonics (Figs. 1, 2) [1-4]. In this talk, we will discuss about novel transport properties in these structures such as Coulomb blockade properties (Fig. 3) and random telegraph noise (Fig. 4).

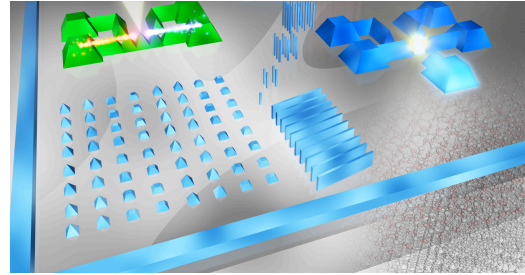


Fig. 1: Quantum Confined Nano-structures.

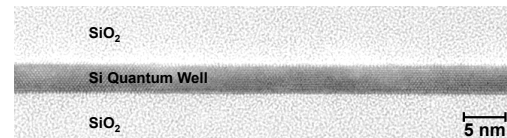


Fig. 2: Si Quantum Well.

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References

1. K. Debnath, A. Z. Khokhar, S. A. Boden, H. Arimoto, S. Z. Oo, H. M. H. Chong, G. T. Reed, and S. Saito, *Front. Mat.* **3**, 51 (2016).
2. S. Saito, A. Z. Al-Attili, K. Oda, and Y. Ishikawa, *Semicond. Sci. Technol.* **31**, 043002 (2016).
3. K. Debnath, H. Arimoto, M. K. Husain, A. Prasmusinto, A. Z. Al-Attili, R. Petra, H. M. Chong, G. T. Reed, and S. Saito, *Front. Mat.* **3**, 10 (2016).
4. S. Saito, Y. Suwa, H. Arimoto, N. Sakuma, D. Hisamoto, H. Uchiyama, J. Yamamoto, T. Sakamizu, T. Mine, S. Kimura, T. Sugawara, and M. Aoki, *Appl. Phys. Lett.* **95**, 241101 (2009).

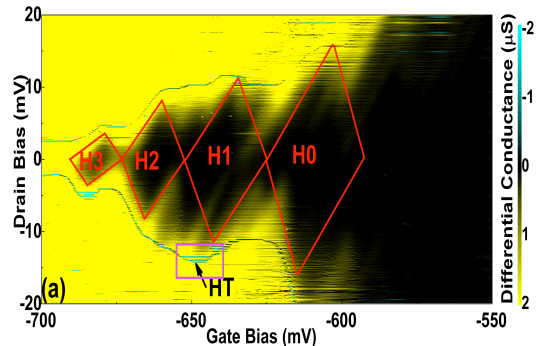


Fig. 3: Coulomb blockade in a transistor.

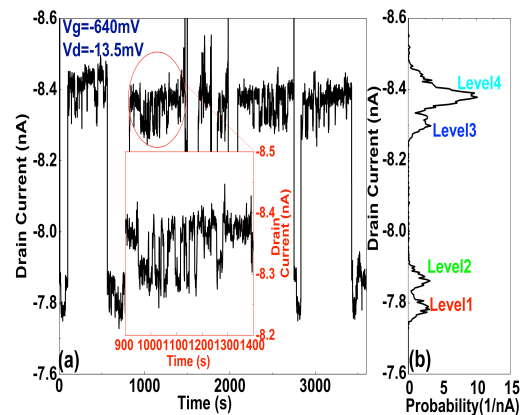


Fig. 4: Random telegraph noise.