CIRMM

Nomura LAB.

[Physics and device applications of Integrated quantum electronic systems]

Department of Informatics and Electronics

Center for International Research on MicroNano Mechatronics

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Integrated Quantum Electronics

Department of Electronic Engineering and Information Systems

Quantum nanophysics and its device applications

Controlling motion of semiconductor nanomechanical systems

Our research target s are investigation of characteristic physics in strongly coupled systems of electronics-photonics-mechanics and applications to new functional devices. We design, fabricate, and analyze the performance of the systems using optical and electrical measurements. Controlling motion of semiconductor nanomechanical structures using photonic and phononic crystal nanostructures are current main topics.

- Controlling thermal conduction by Si phononic crystal nanostructures
- Potentials of nanostructured Si for thermoelectric generation
- Physics and applications of nano optomechanical systems
- Electron transport in semiconductor nanostructures

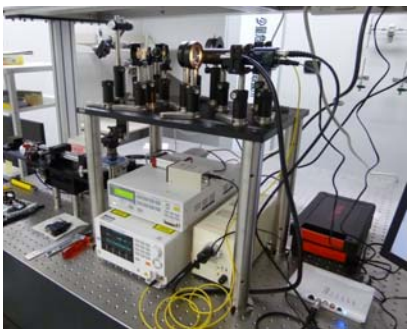

Fig. 1. Near-infrared micro spectroscopy system.

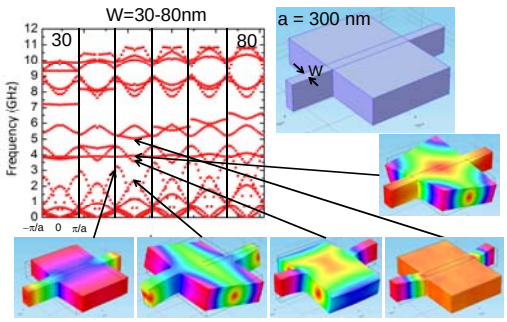

Fig. 2. Simulations of phononic crystal nanostructures for phononic band diagram and mode analyses.

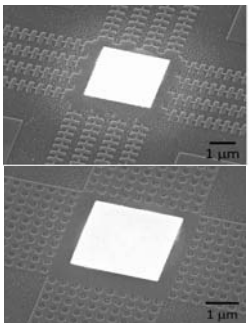

Fig. 3. SEM of photonic crystal nanostructures for thermal conductivity measurements.

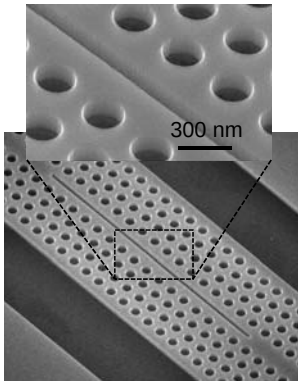

Fig. 4. SEM of GaAs nano optomechanical system with photonic crystal nanocavity.

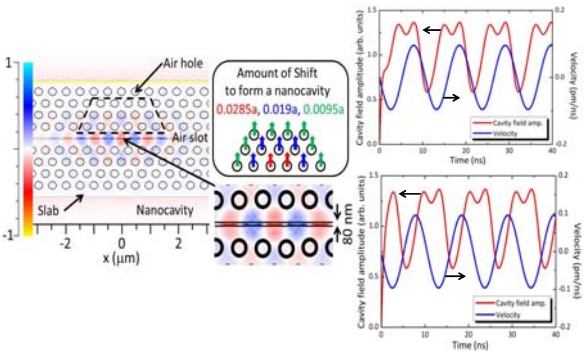

Fig. 5. Electric field localization in photonic crystal nanocavity and optical suppression and amplification of motion of the nanomechanical oscillator.

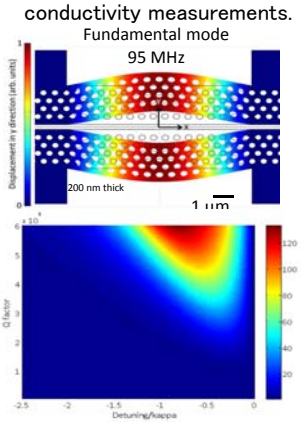

Fig. 6. Fundamental mechanical mode and cooling factors.

Partially collaboration with Hirakawa Lab. and Arakawa-Iwamoto Labs.