

Nomura LAB.

Energy harvesting by nanotechnology -Nanoscale heat transfer and thermoelectrics-

Centre for Interdisciplinary Research on Micro-Nano Methods

<http://www.nlab.iis.u-tokyo.ac.jp>

Integrated Quantum Electronics, Thermal Phononics

Department of Electronic Engineering and Information Systems

Thermal conduction nanoengineering and Thermoelectric energy harvesting

Coherent control of heat transfer in semiconductor nanostructures by phononics

Thermal conduction can be controlled by nanoengineering. Our goal is to use nanofabrication technology to develop highly efficient silicon thermoelectric devices for **energy harvesting** and **thermoelectric applications**.

- ◆ Nanoscale heat transport; Physics, Control, and Thermoelectric devices
- ◆ Thermal Phononics ~Si **phononic crystals**~
- ◆ Large-area Si energy harvester using nanostructures
- ◆ Physics in **optomechanical systems** with photonic crystal nanocavity

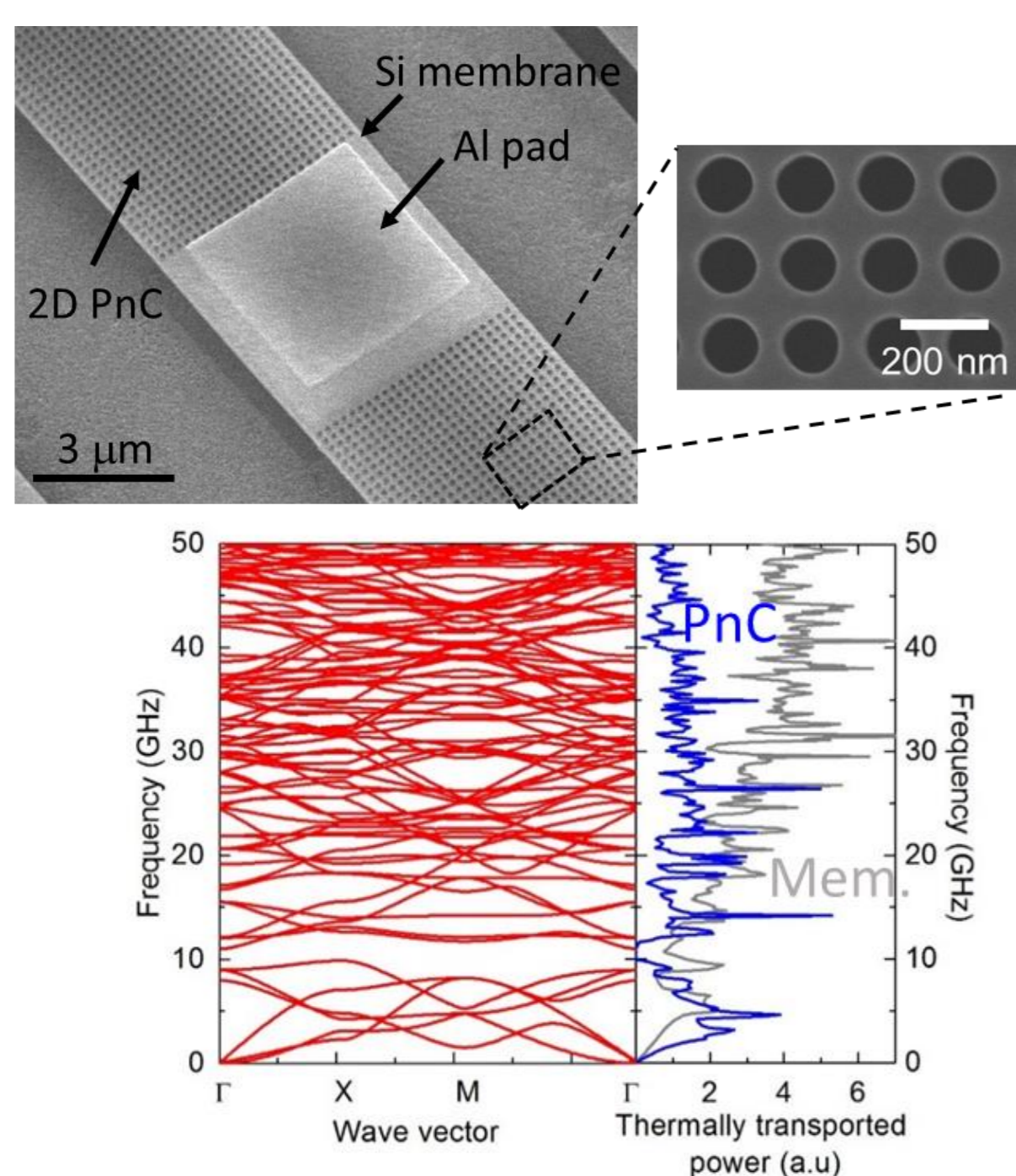


Fig. 1. SEM images of fabricated phononic crystal nanostructures. Calculated band diagram and heat flux spectrum.

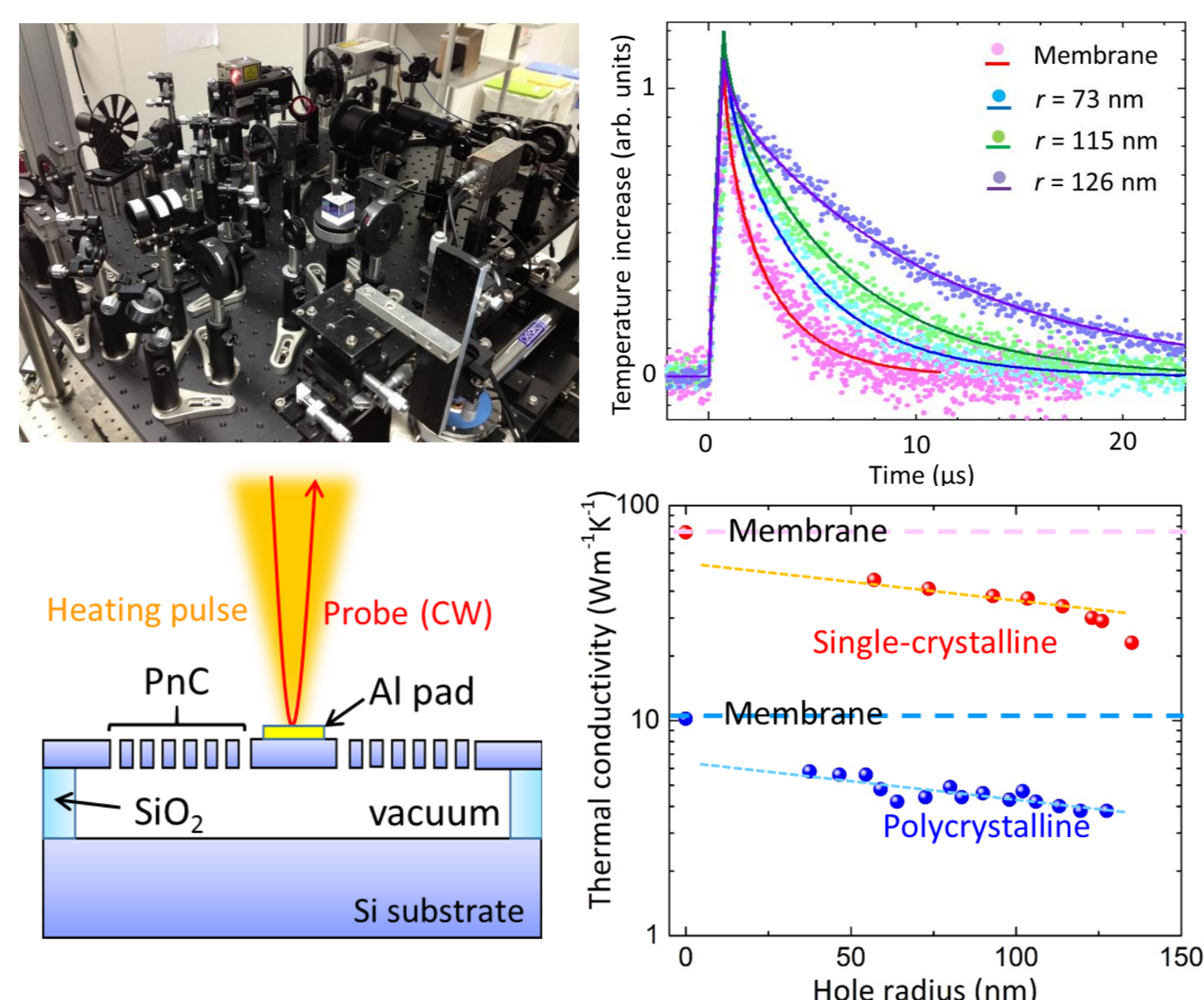
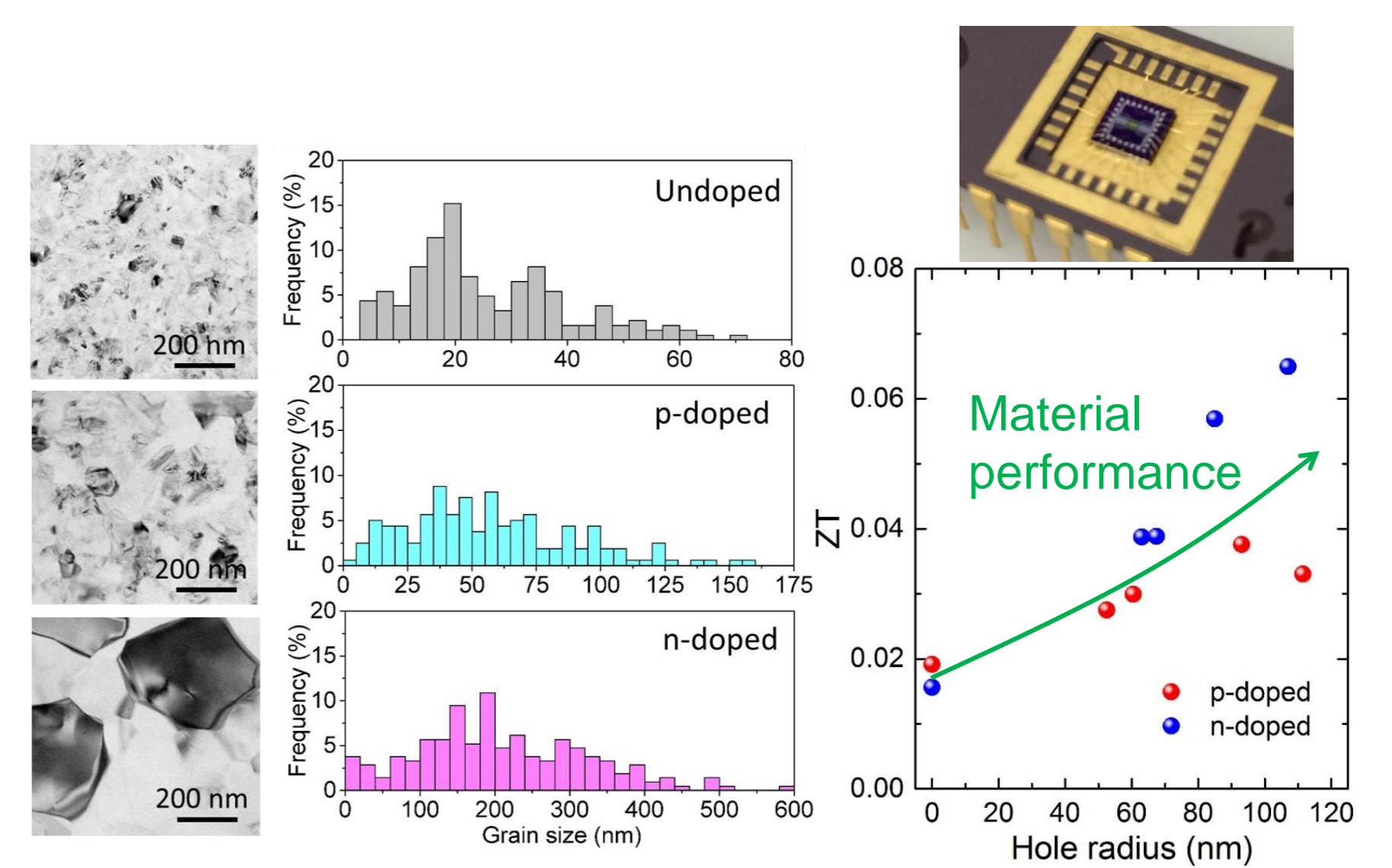


Fig. 2. μ TDTR system and thermal conductivity of PnC nanostructures.



Collaboration with Freiburg Univ. (Germany).

Fig. 3. Development of polycrystalline Si PnC thermoelectric materials.

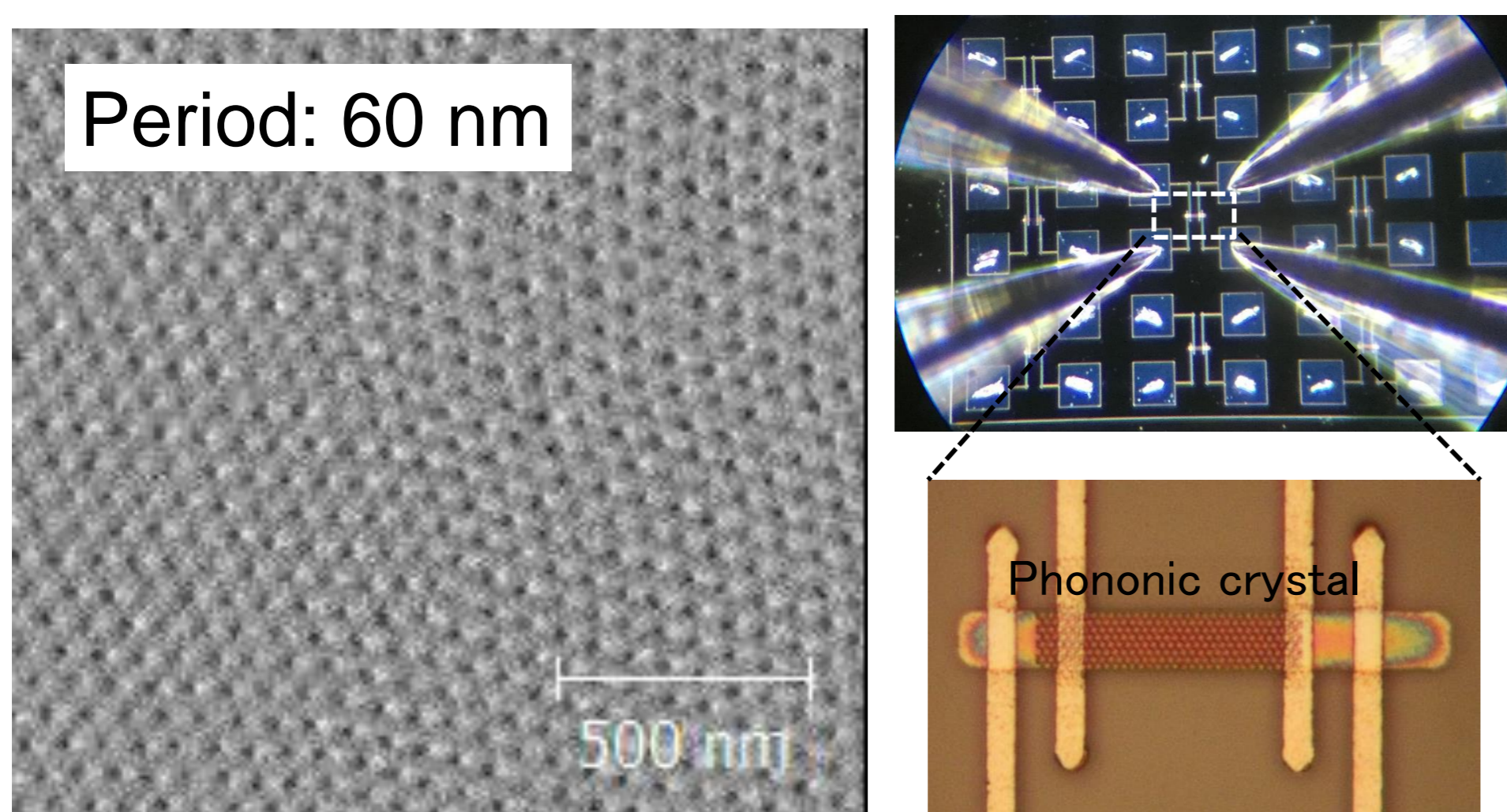


Fig. 4. Energy harvesters using large-area Si thermoelectric nanomaterials and application to smart community.

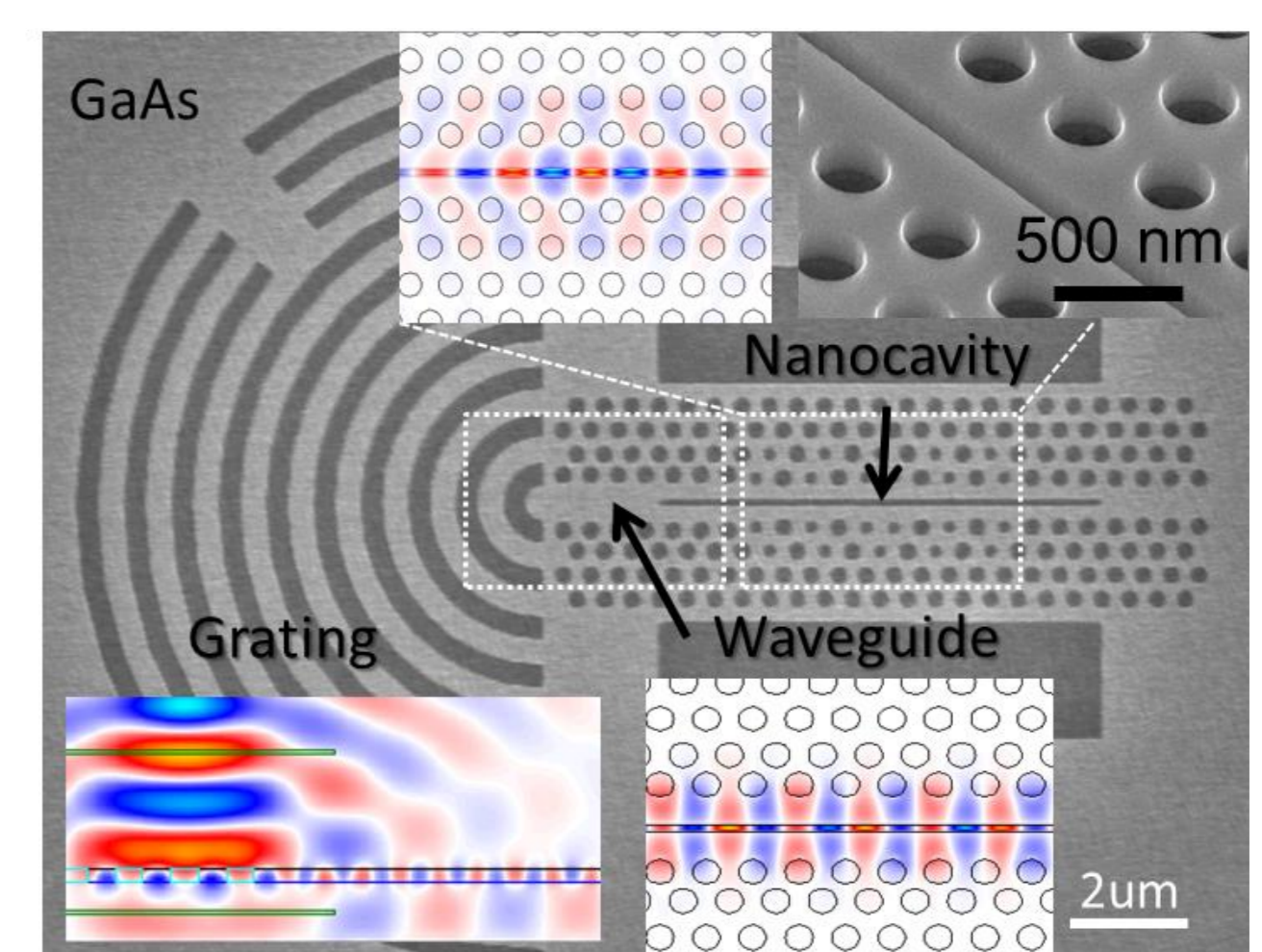
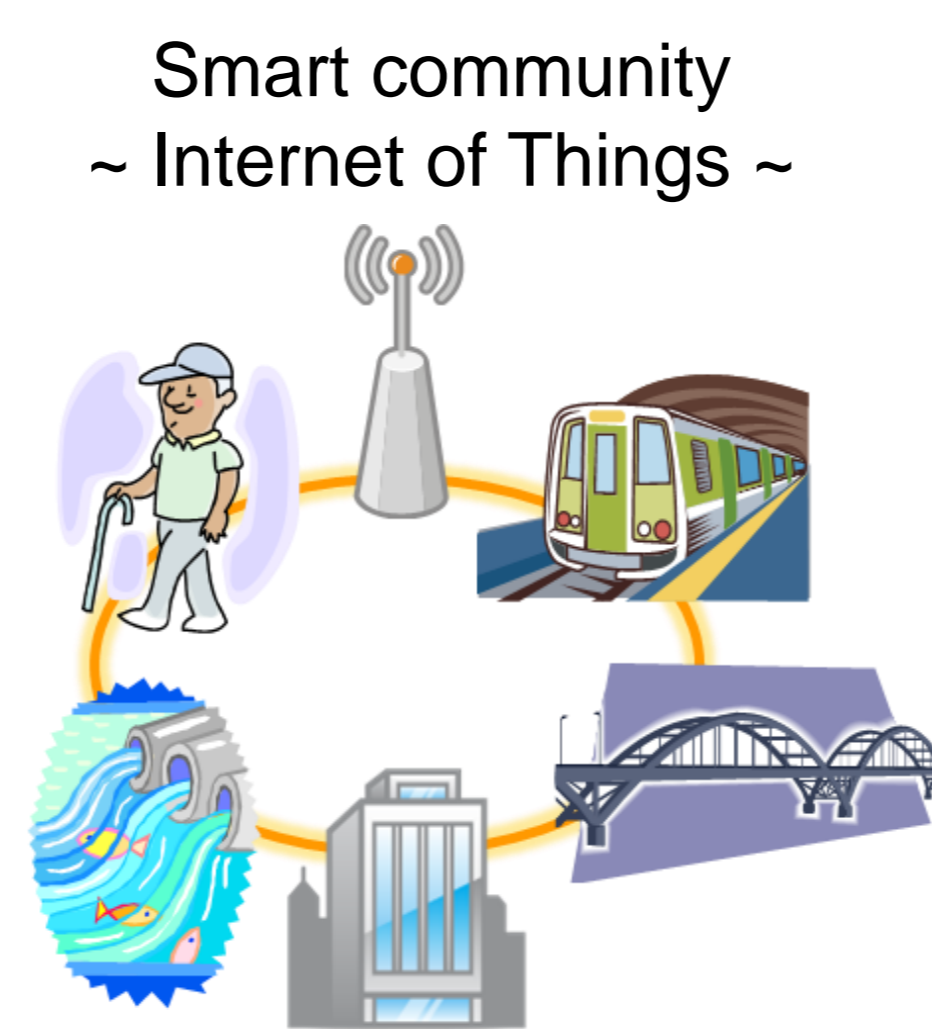


Fig. 5. Investigated GaAs optomechanical system with an air-slot PhC nanocavity.

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