

## 1. Missions

- Developments of quantum materials research and establishment of a research center in NIMS for quantum materials and technology innovation.
- R&D of quantum materials for sensors and telecommunication by thin film and bulk single crystal growth technologies of NIMS in collaboration with universities and other research institutes.

## 2. Activities

Research and development focused on the following themes from 2020.

### ① Quantum Magnetic Sensing

- Increase of sensitivity by optimizing diamond NV center density and their spin coherence time.
- Single diamond NV center in nanometer depth.
- Decoherence mechanism of electron spins.
- Search for novel color centers in ultra-wide-gap materials.

### ② Quantum Light Source

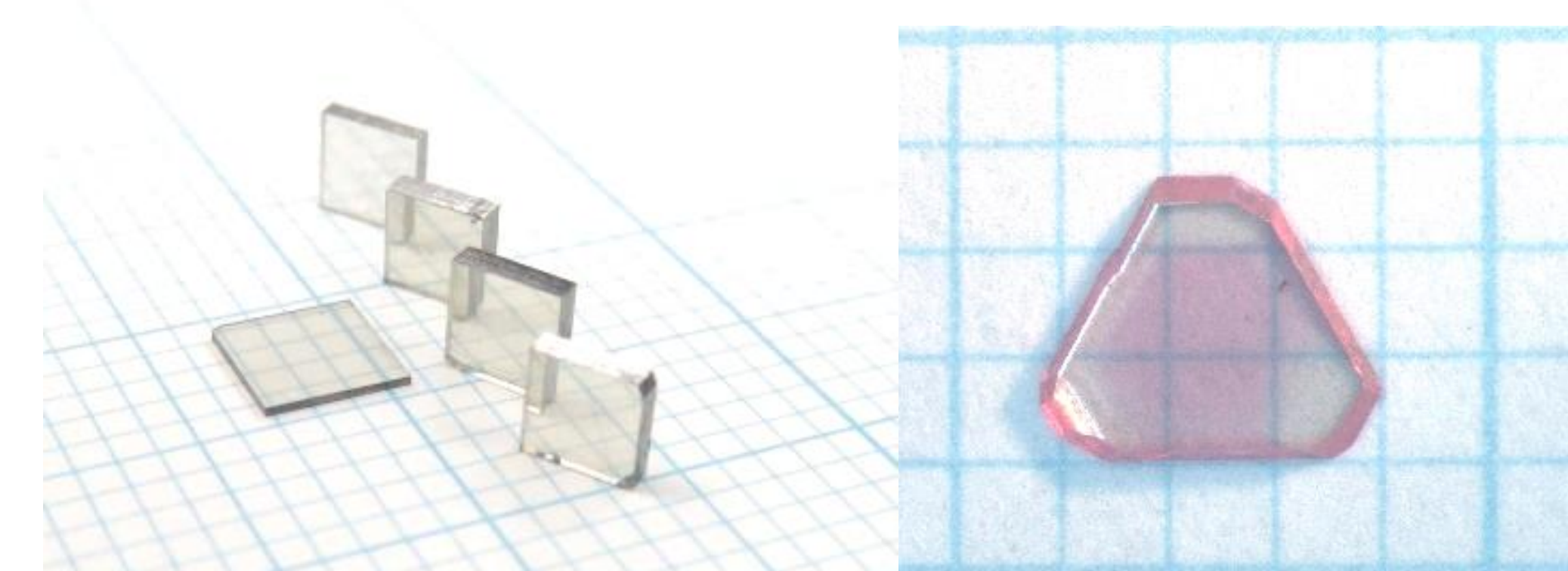
- Synthesis of quantum dots for telecommunication.
- High temperature operation of photon source by band-gap engineering.
- High power light source devices.

### ③ Innovative Photonic Functions

- Novel topological photonic quantum materials.
- Novel functions by light-matter interaction.
- Basic technology for innovative semiconductor topological photonics.
- Topological photonic crystal lasers and their applications.

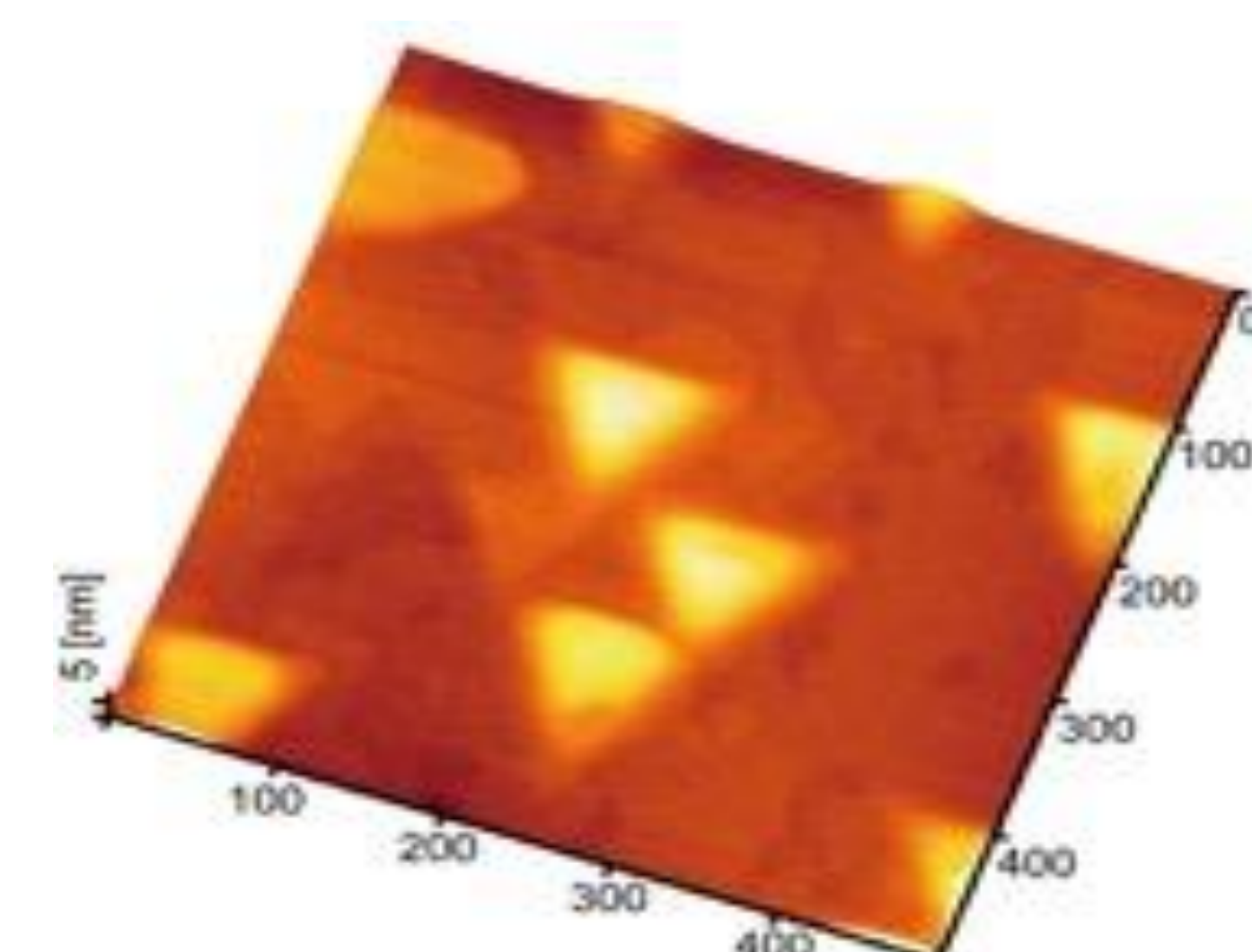
### ④ Basic Research for Quantum Technology Innovation

- Emergent quantum functionalities in structural controlled atomic layer materials.
- Novel topological quantum bit materials.
- Quantum-enhanced magnetic memory and sensor. 2D moiré superlattice.
- High-quality single-crystals topological materials.

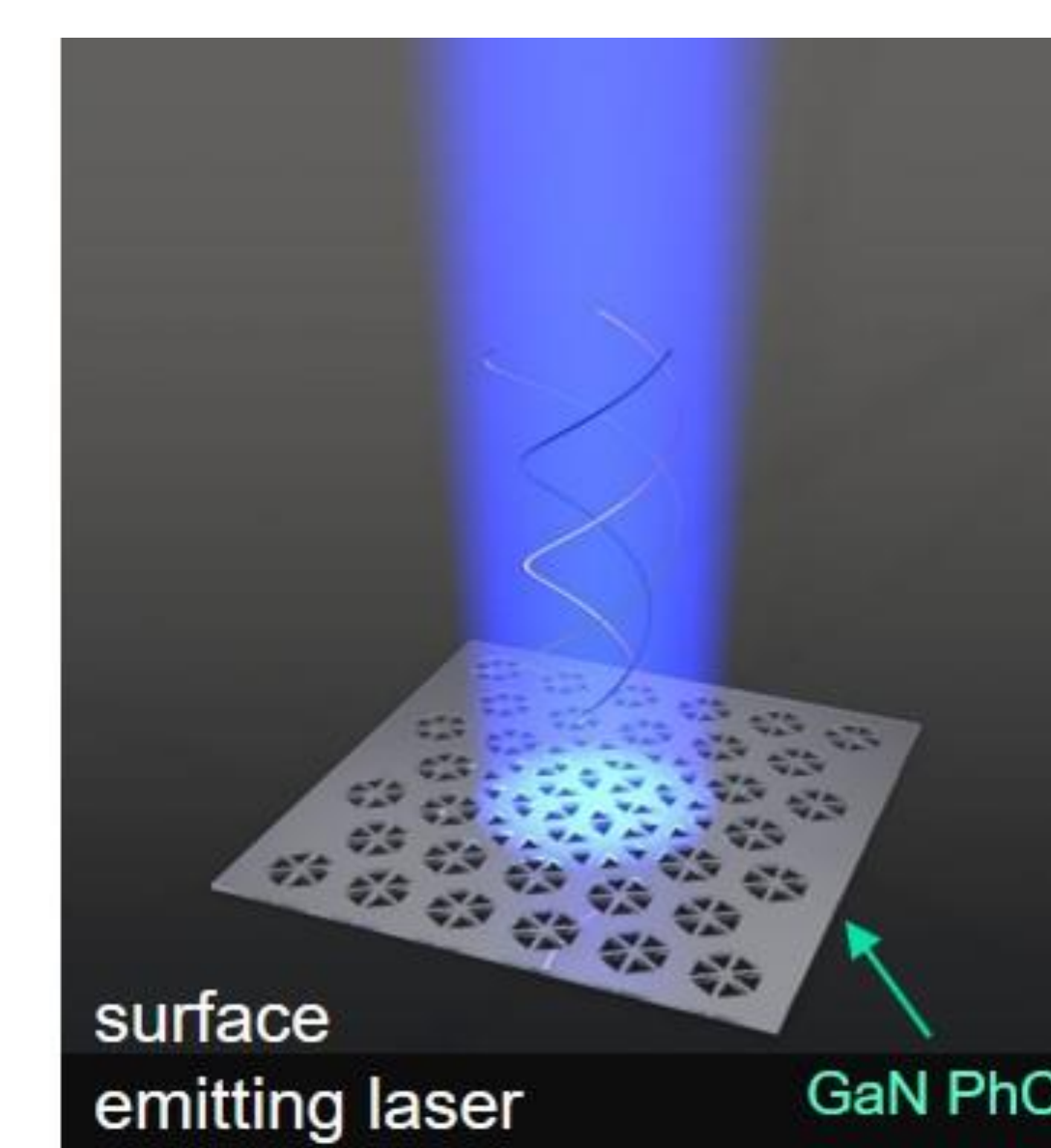


(left) N-doped CVD diamond single crystals.

(right) Red fluorescing HPHT single crystal diamond.



Nanoscale semiconducting quantum dots.



Photonic crystal laser.

