SE-01-03

# Creation of spin defects in wide bandgap semiconductors for quantum sensing

**Takeshi Ohshima**

*National Institutes for Quantum Science and Technology*

## Abstract

Spin defects in wide bandgap semiconductors are expected to be applied to qubits and quantum sensors. Negatively charged nitrogen - vacancy (NV) center in diamond is known as one of the most promising candidates for qubits and quantum sensors since photoluminescence from single NV center can be detected and its spin can be manipulated even at room temperature. Particle irradiation such as ions and electrons is a powerful tool to introduce such spin defects in wide bandgap semiconductors. In this talk, I will show the electron irradiation techniques to create ensemble NV centers for quantum sensing. The amounts of NV centers created by electron irradiation at elevated temperature are compared with those by room temperature irradiation followed by thermal annealing. Also, I will introduce the creation of multiple NV centers by the implantation of molecular ions which contain N atoms such as adenine and phthalocyanine ions. In addition, I will talk about the creation of negatively charged silicon vacancy (Vsi) in silicon carbide (SiC), which also acts as spin defects, using the particle beam writing (PBW) technique. PBW is a useful technique to create Vsi at certain locations. Therefore, we locally create Vsi in SiC devices and the local temperature and magnetic field induced by currents in SiC devices can be measured.