



Lecture2 Nitrogen-vacancy center in diamond

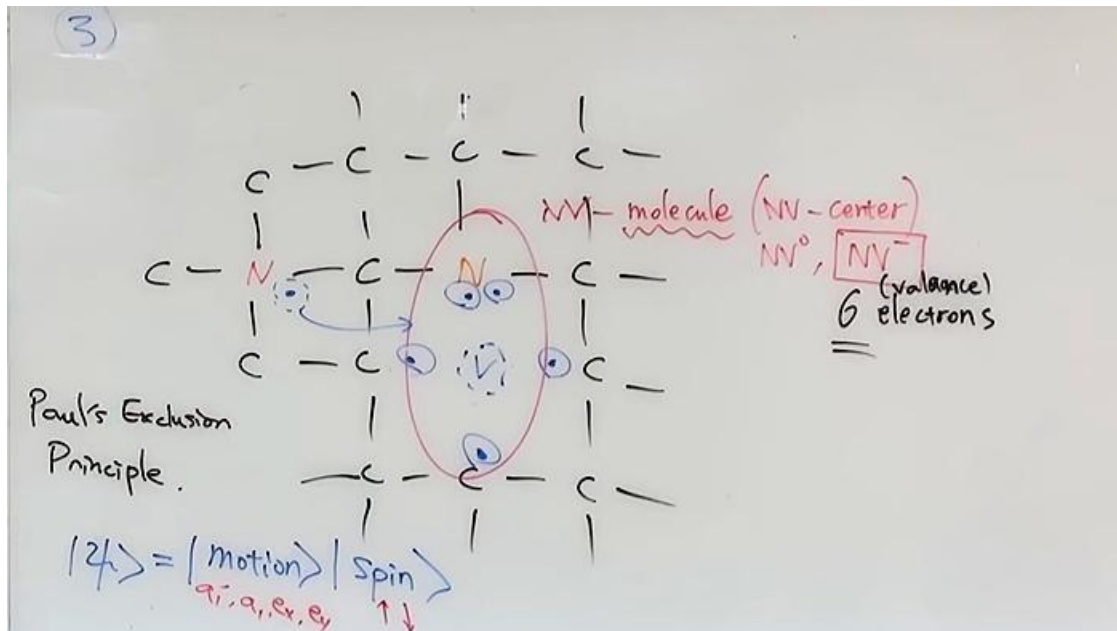
Nitrogen-Vacancy Center

- electronic structure
- fluorescence spectrum
- optical pumping

Nitrogen-Vacancy Center (room temperature ambient condition)

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The diagrams illustrate the electronic structure of the Nitrogen-Vacancy (NV) center in diamond. The top diagram shows a nitrogen atom (N) with five valence electrons (represented by dots) and a neighboring carbon atom (C) with four valence electrons. The bottom diagram shows a nitrogen atom (N) with five valence electrons and a vacancy (V) in the diamond lattice. The vacancy is represented by a circle with a cross, indicating a missing carbon atom. The nitrogen atom is labeled ^{14}N and the vacancy is labeled ^{12}C . The diagrams also show the electronic structure of the NV center, with the nitrogen atom having five valence electrons and the vacancy having two core electrons. The diagrams are labeled "Valence electron (5)", "Core electron (2)", and "dangling bonds".



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photon

boson. (Bose-Einstein distribution)

fermion. (Fermi-Dirac distribution)

electron

NV-molecule.

Conduction Band

Valance Band

$\sim 2\text{eV}$ (Semiconductor)

$\sim 5\text{eV}$ (diamond)

e_x, e_y, e_z

$\uparrow \downarrow$



