Diamond

2012.9.28

Seoncheol Cha

Why is diamond beauty?
Especially, the color

NANOSCALE MAGNETOMETRY

Microscopy with single spins

Two teams of researchers have exploited defects in diamond to demonstrate a new approach to magnetic sensing and imaging at the nanoscale.

nature nanotechnology | VOL 3 | NOVEMBER 2008 | www.nature.com/naturenanotechnology

APPLIED PHYSICS

Virtues of diamond defects

Michael Romalis

A general method for detecting nuclear magnetic resonance signals from a single molecule has so far been elusive. Magnetic sensors that exploit crystal imperfections in diamond might make such a method a reality.

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~ nano Tesla

LETTERS

Nanoscale magnetic sensing with an individual electronic spin in diamond

J. R. Maze[1], P. L. Stanwix[2], J. S. Hodges[1,3], S. Hong[1], J. M. Taylor[4], P. Cappellaro[1,2], L. Jiang[1], M. V. Gurudev Dutt[5], E. Togan[1], A. S. Zibrov[1], A. Yacoby[1], R. L. Walsworth[1,2] & M. D. Lukin[1]

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LETTERS

Nanoscale imaging magnetometry with diamond spins under ambient conditions

~ nano meter

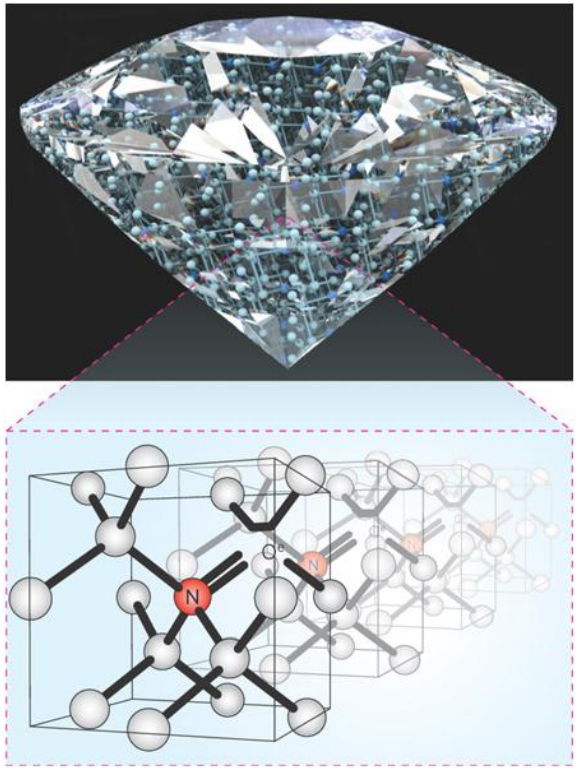
Gopalakrishnan Balasubramanian[1], I. Y. Chan[2]†, Roman Kolesov[1], Mohannad Al-Hmoud[1], Julia Tisler[1], Chang Shin[3], Changdong Kim[3], Aleksander Wojcik[3], Philip R. Hemmer[3], Anke Krueger[4], Tobias Hanke[5], Alfred Leitenstorfer[5], Rudolf Bratschitsch[5], Fedor Jelezko[1] & Jörg Wrachtrup[1]

Nitrogen-Vacancy (NV) in Diamond

Defects in diamond are one of the reason of the color properties of diamond

Nitrogen substitutes carbon next vacancy site

- Nitrogen-vacancy color center



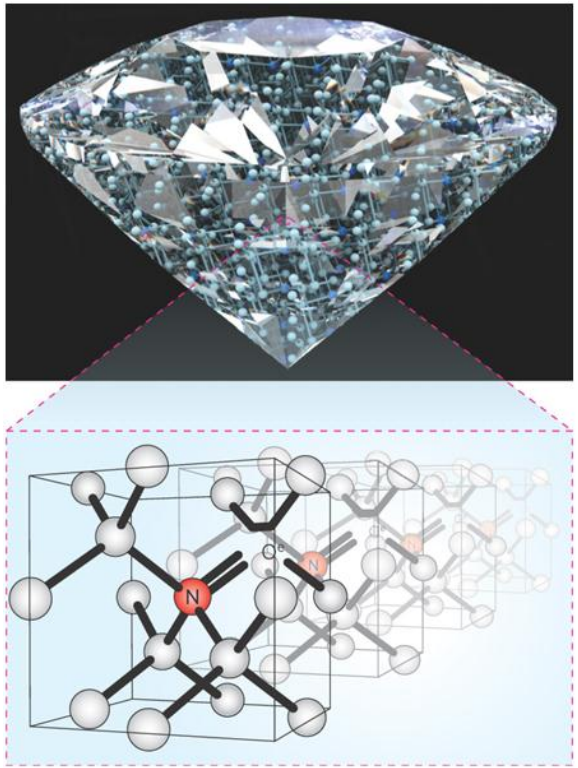
Importance of Nitrogen-Vacancy in Diamond

Atom afixed in solid
- further trapping is not required
- well-defined energy level

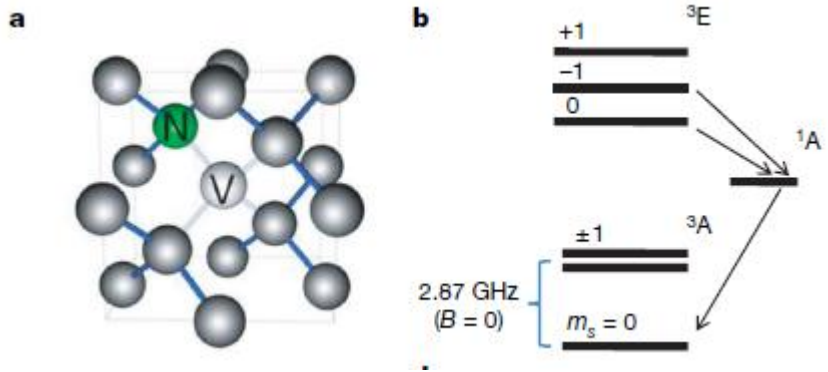
Chemically extremely stable

Long spin coherence time

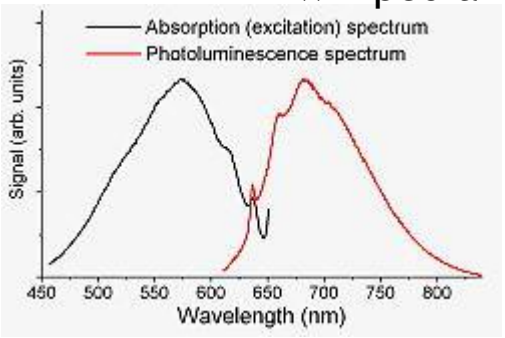
Possible to manipulate states selectively



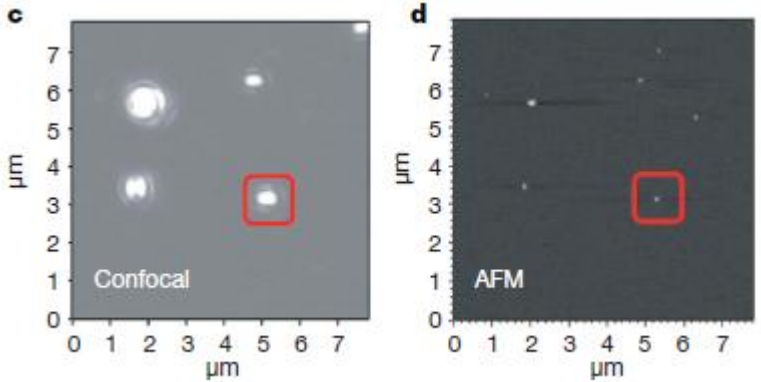
Energy level of Nitrogen-Vacancy in Diamond



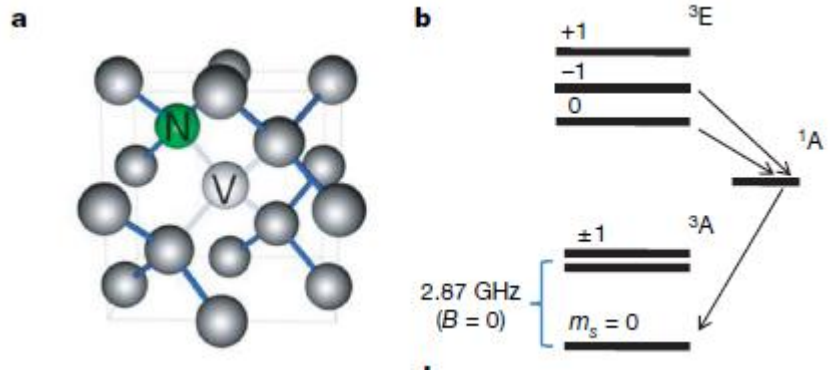
wikipedia

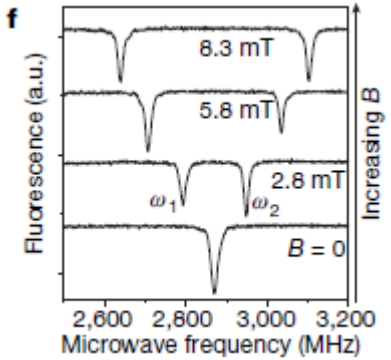


2 unpaired electron



Nitrogen-Vacancy in Diamond in magnetic field



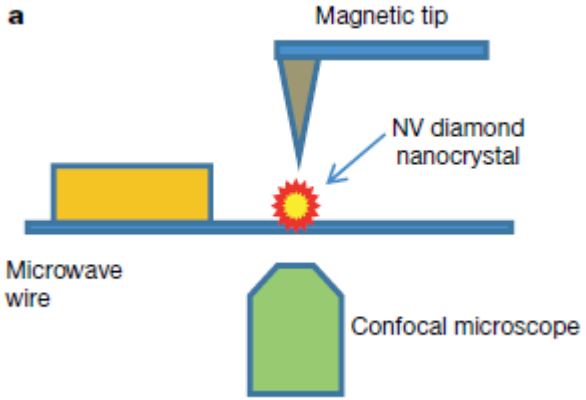


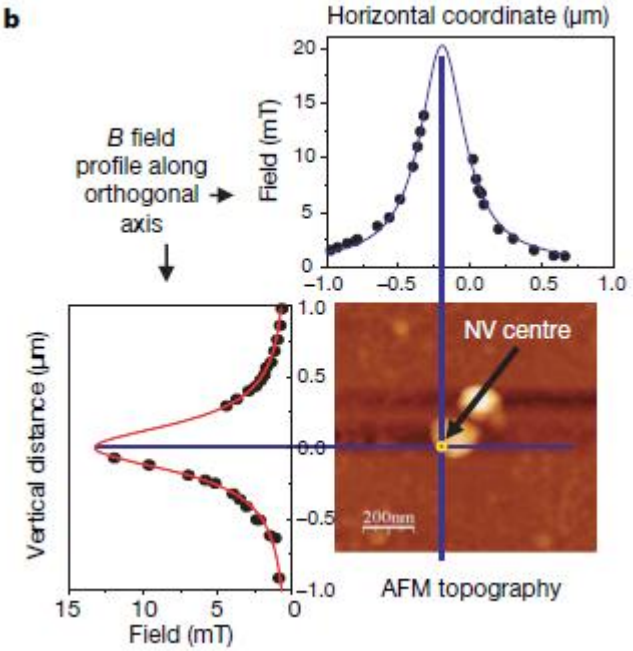
2 unpaired electron

m_s = ±1 degenerate at B=0

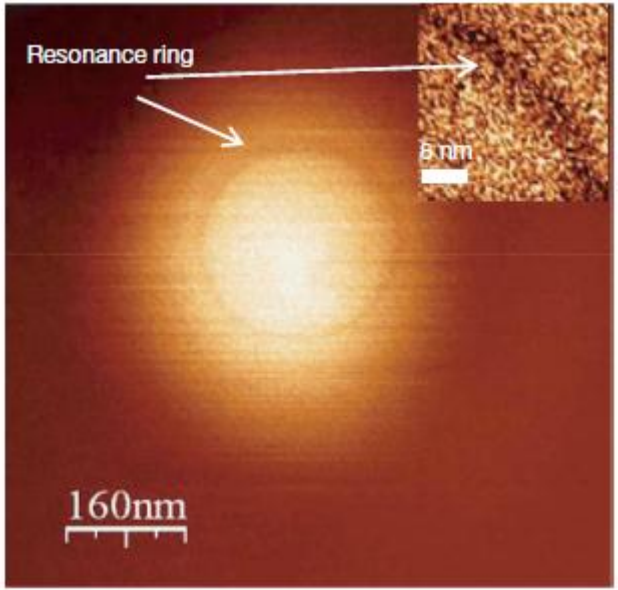
Split as increasing B

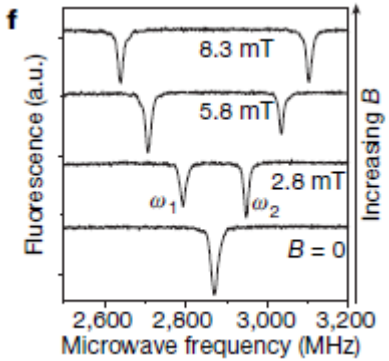
Nanoscale Imaging of NV in diamond



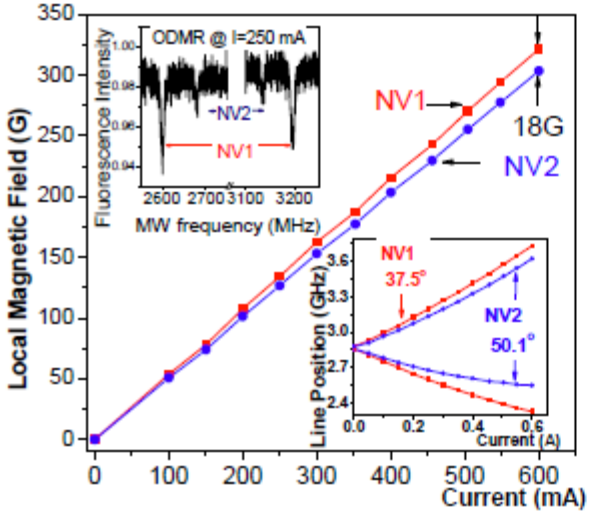


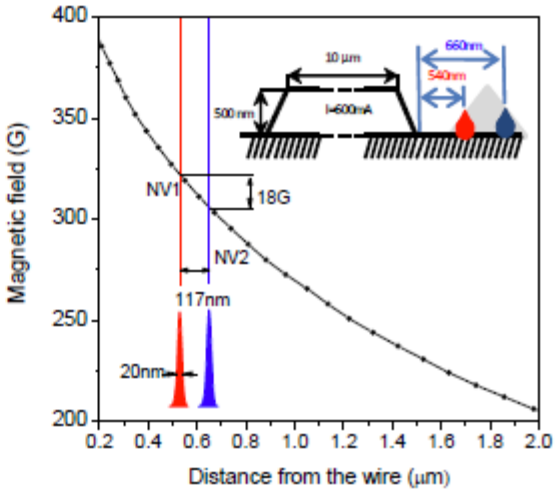
Nanoscale Imaging of NV in diamond





Nanoscale measurement of two NV in diamond





Nanoscale Imaging by NV in diamond