

Institute for Chemical Research
MIZUOCHI Laboratory

Lecture by Dr. Brett C. Johnson

Date: Friday, September 23, 2016

Time: 14:00-15:00

Place: Kyoto University, Uji campus, main building, Room M-442C

Single photon sources in silicon carbide

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Single defects in silicon carbide have unique properties amenable to applications in emerging quantum technologies such as quantum cryptography and quantum information processing. Understanding the formation of isolated single defects, their properties and atomic identity is a challenging and active area of research. In this talk I will discuss our efforts to integrate various single defects into both photonic and electronic devices [1-4]. In particular, we have mostly focussed on a near-surface related defect that can be formed in a number of SiC polytypes. Photons emitted from these defects are highly polarized, within the visible wavelength range, stable, produced at high count rates and can be electrically driven. I will also briefly mention our broader pursuits to build a quantum computer.

- [1] A. Lohrmann, S. Castelletto, J. R. Klein, T. Ohshima, M. Bosi, M. Negri, D. W. M. Lau, B. C. Gibson, S. Praver, J. C. McCallum, and B. C. Johnson, *Activation and control of visible single defects in 4H-, 6H- and 3C-SiC by oxidation*, **Appl. Phys. Lett.**, 108, 021107 (2016).
- [2] A. Lohrmann, N. Iwamoto, Z. Bodrog, S. Castelletto, T. Ohshima, T. J. Karle, A. Gali, S. Praver, J. C. McCallum, and B. C. Johnson, *Single photon emitting diode in silicon carbide*, **Nat. Comms**, 6 7783 (2015).
- [3] Stefania Castelletto, Brett C. Johnson, Cameron Zachreson, Dávid Beke, István Balogh, Takeshi Ohshima, Igor Aharonovich, and Adam Gali, *Room Temperature Quantum Emission from Cubic Silicon Carbide Nanoparticles*, **ACS Nano**, 8, 7938 (2014).
- [4] S. Castelletto, B. C. Johnson, V. Ivady, N. Stavrias, T. Umeda, A. Gali, and T. Ohshima. *A silicon carbide room temperature single photon source*, **Nat. Mater.**, 13, 151 (2014).