SYMPOSIUM ED1

Silicon-Carbide, Diamond and Related Materials for Quantum Technologies
April 18 - April 20, 2017

Symposium Organizers
Adam Gali, Wigner Research Centre for Physics
D. Kurt Gaskill, US Naval Research Laboratory
Brenda VanMil, US Army Research Laboratory
Joerg Wrachtrup, Stuttgart University

Symposium Support
U.S. Army Research Laboratory-Army Quantum Science and Engineering Program

Proceedings Statement
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* Invited Paper

SESSION ED1.1/ED12.1: Joint Session I: Solid-State Quantum Matter I
Session Chair: Joerg Wrachtrup
Tuesday Morning, April 18, 2017
PCC North, 100 Level, Room 132 A

10:30 AM *ED1.1.01/ED12.1.01
Creating Quantum Technologies with Spins in Semiconductors David Awschalom; University of Chicago, United States.

11:00 AM *ED1.1.02/ED12.1.02
Single Photon Emitters—Diamond and Beyond Igor Aharonovich; University of Technology Sydney, Australia.

11:30 AM *ED1.1.03/ED12.1.03
Single Photon Sources in Silicon Carbide Brett Johnson; University of Melbourne, Australia.

SESSION ED1.2/ED12.2: Joint Session II: Advanced Spin Control for Quantum Technology
Session Chair: Vladimir Dyakonov
Tuesday Afternoon, April 18, 2017
PCC North, 100 Level, Room 132 A

1:30 PM *ED1.2.01/ED12.2.01
Color Centers Coupled to Nanobeam Cavities in 4H Silicon Carbide—Beyond "Simple" Resonant Enhancement Evelyn L. Hu; Harvard University, United States.

2:00 PM *ED1.2.02/ED12.2.02
Theory of Dynamic Nuclear Polarization through Hybrid Registers in Diamond and SiC Viktor Ivady[1,2]; [1]Linköping University, Sweden; [2]Wigner Research Centre for Physics, Hungary.

2:30 PM *ED1.2.03/ED12.2.03
Silicon Vacancies in Silicon Carbide as a Novel Quantum System Sang-Yun Lee[1,2]; [1]University of Stuttgart and Stuttgart Research Center of Photonic Engineering (SCoPE) and IQST, Germany; [2]Korea Institute of Science and Technology, Korea (the Republic of).

3:00 PM BREAK

SESSION ED1.3/ED12.3: Joint Session III: Spintronics and Optomechanics
Session Chairs: Brett Johnson and Ren-Bao Liu
Tuesday Afternoon, April 18, 2017
PCC North, 100 Level, Room 132 A

3:30 PM *ED1.3.01/ED12.3.01
Nanomechanical Sensing Using Spins in Diamond Marcus W. Doherty; Australian National University, Australia.

4:00 PM *ED1.3.02/ED12.3.02
Nuclear Spintronics in Silicon Carbide Abram Falk[1,2]; [1]IBM T.J. Watson Research Center, United States; [2]University of Chicago, United States.

4:30 PM *ED1.3.03/ED12.3.03
Tunneling-Mediated Charge Transfer between Nitrogen-Vacancy Centers and Nitrogen Impurities in Type-1b Diamond Carlos A. Meriles; City College of New York, United States.

SESSION ED1.4/ED12.4: Joint Session IV: Solid-State Quantum Matter II
Session Chair: Evelyn Hu
Wednesday Morning, April 19, 2017
PCC North, 100 Level, Room 132 A

8:00 AM *ED1.4.01/ED12.4.01
Engineering Single-Photon Sources in Hexagonal Boron Nitride Lee Bassett; University of Pennsylvania, United States.

8:30 AM *ED1.4.02/ED12.4.02
Engineering of Highly Coherent Spin Defects in Silicon Carbide Vladimir Dyakonov; University of Wuerzburg, Germany.

9:00 AM *ED1.4.03/ED12.4.03
Spins in Silicon Carbide for Quantum Technologies Paul V. Klimov; University of Chicago, United States.

9:30 AM *ED1.4.04/ED12.4.04
Towards Coherent Manipulation of Single NV Spins Using Hybrid Photoelectric MR Detection Milos Nesladek; imec Leuven & Hasselt University, Belgium.

10:00 AM BREAK

SESSION ED1.5/ED12.5: Joint Session V: Advanced Spin Control for Sensing
Session Chair: Martin Plenio
Wednesday Morning, April 19, 2017
PCC North, 100 Level, Room 132 A

10:30 AM *ED1.5.01/ED12.5.01
Advanced Spin Control for Enhanced Sensing Using NV Centers in Diamond Nir Bar-Gill; Hebrew University, Israel.

11:00 AM *ED1.5.02/ED12.5.02
Novel Sensing Schemes for Frequency Tracking and Resolution Alex Retzker; Racah Institute of Physics, Israel.

11:30 AM *ED1.5.03/ED12.5.03
Nitrogen-Vacancy Diamond Sensor—Novel Diamond Surfaces and Interaction with Spins Adam Gali[1,2]; [1]Hungarian Academy of Sciences, Hungary; [2]Budapest University of Technology and Economics, Hungary.

SESSION ED1.6/ED12.6: Joint Session VI: Sensing of Single Spins
Session Chairs: Patrick Maletinsky and Jean-Francois Roch
Wednesday Afternoon, April 19, 2017
PCC North, 100 Level, Room 132 A

1:30 PM *ED1.6.01/ED12.6.01
Sensing Single Molecular Spins Joerg Wrachtrup[1,2]; [1]University of Stuttgart, Germany; [2]Institute for Quantum Science and Technology, IQST, Germany.

2:00 PM *ED1.6.02/ED12.6.02
Single-Molecule Electron Spin Resonance Spectroscopy by Diamond Sensor Fazhan Shi; University of Science and Technology of China, China.

2:30 PM BREAK

3:30 PM *ED1.6.03/ED12.6.03
Quantum Sensing and Imaging with Diamond Color Centers Fedor Jelezko; University Ulm, Germany.

4:00 PM *ED1.6.04/ED12.6.04
Coherent Few-Spin Systems in Diamond Nanocrystals for Quantum Sensing Helena S. Knowles; University of Cambridge, United Kingdom.

4:30 PM *ED1.6.05/ED12.6.05
Nanoscale Nuclear Magnetic Resonance and Scanning Magnetometry with Single NV Centers in Diamond Christian Degen; ETH Zurich, Switzerland.

SESSION ED1.7: Poster Session
Session Chair: Brenda VanMil
Wednesday Afternoon, April 19, 2017
8:00 PM - 10:00 PM
Sheraton, Third Level, Phoenix Ballroom

ED1.7.01
Single Spins in Silicon Carbide—Coherent Control, Charge State Manipulation and Photonic Structures Matthias Widmann; 3rd Institute of Physics, University of Stuttgart and Stuttgart Research Center of Photonic Engineering (SCoPE) and IQST, Germany.

ED1.7.02
Pure Nanodiamonds for Vacuum Levitated Optomechanics Angelo Frangeskou; University of Warwick, United Kingdom.

ED1.7.03
Behavior of Nitrogen-Related Luminescence Centers in Laser-Cut Single-Crystalline Diamond under Irradiation of keV Electron Beam Kenji Maruoka; Osaka University, Japan.

ED1.7.04
Structures and Emission Properties of Transition Metal Color Centers in Diamond Nicholas W. Gothard; University of Dayton Research Institute, United States.

ED1.7.05
Reliable Industrial Optical Metrology for Characterization of Stress, Dimensions and Electrical Properties Silicon Carbide (SiC) Epilayers Grown on SiC and Other Isotropic and Anisotropic Substrates Wojciech Walecki; Frontier Semiconductor, United States.

ED1.7.06
Boron Doping of HFCVD Grown Diamond for Device Applications Gary L. Harris[1,2]; [1]Howard University, United States; [2]Howard University, United States.

ED1.7.07
A Comparison of NV Centers in Diamond and 3C-SiC—A Photo EPR Study Hans Jurgen von Bardeleben; University Pierre et Marie Curie, France.

ED1.7.08
Magnetic and Optical Properties of NV Centers in 4H-SiC Hans Jurgen von Bardeleben; University Pierre et Marie Curie, France.

ED1.7.09
Directed Covalent Assembly of Nanodiamonds into Continuous Thin Films for MEMS/NEMS Adarsh D. Radadia; Louisiana Tech University, United States.

SESSION ED1.8/ED12.8: Joint Session VII: Qubit Arrays and Spin Device Principles
Session Chairs: Fedor Jelezko and Milos Nesladek
Thursday Morning, April 20, 2017
PCC North, 100 Level, Room 132 A

8:00 AM *ED1.8.01/ED12.8.01
Scaled Control of Solid-State Qubit Arrays Michael Trupke; University of Vienna, Austria.

8:30 AM *ED1.8.02/ED12.8.02
Quantum Sensing and Imaging using Color Centers in Diamond and Extensions to Quantum Networks Dirk R. Englund; Massachusetts Institute of Technology, United States.

9:00 AM *ED1.8.03/ED12.8.03
Silicon Carbide—Material Growth and Defect Engineering for Spintronics Nguyen T. Son; Linkoping University, Sweden.

9:30 AM ED1.8.04/ED12.8.04
Defects and Decoherence at Diamond Surfaces Alastair Stacey[1,2]; [1]University of Melbourne, Australia; [2]Melbourne Centre for Nanofabrication, Australia.

9:45 AM ED1.8.05/ED12.8.05
High Purity and High Quality Homoepitaxial Diamond Growth for Quantum Information and Quantum Sensing Device Applications Tokuyuki Teraji; National Institute for Materials Science, Japan.

10:00 AM BREAK

SESSION ED1.9: Near-Infrared Emitters for Quantum Technology
Session Chairs: Igor Aharonovich and D. Kurt Gaskill
Thursday Morning, April 20, 2017
PCC North, 100 Level, Room 128 B

10:30 AM *ED1.9.01
NV Centers in Silicon Carbide—From Theoretical Predictions to Experimental Observation Hans Jurgen von Bardeleben; University Pierre et Marie Curie, France.

11:00 AM *ED1.9.02
New Color Centers in Diamond for Long Distance Quantum Communication Nathalie P. de Leon; Princeton University, United States.

11:30 AM *ED1.9.03
Single Color Center Engineering in Nanodiamond Luke Bissell; Air Force Research Laboratory, United States.

SESSION ED1.10: Simulation and Fabrication of Defect Spins
Session Chairs: Sang-Yun Lee and Rachael Myers-Ward
Thursday Afternoon, April 20, 2017
PCC North, 100 Level, Room 128 B

1:30 PM *ED1.10.01
Spin Coherence and Optical Properties of the Silicon Vacancy in SiC Samuel G. Carter; U.S. Naval Research Laboratory, United States.

2:00 PM ED1.10.02
Electronic Structure of TM-V Complexes in Diamond—A Density Functional Theory Analysis Kamil M. Czelej; Warsaw University of Technology, Poland.

2:15 PM ED1.10.03
Multiscale Green's Function Method for Modeling Strain Field Due to a Nitrogen-Vacancy Center in Diamond Vinod K. Tewary; National Institute of Standards and Technology, United States.

2:30 PM ED1.10.04
Defects in SiC Characterized by Magnetometry Shengqiang Zhou; Helmholtz-Zentrum Dresden-Rossendorf, Germany.

2:45 PM ED1.10.05
Investigation of the Structural and Optical Behaviors of Self-Aligned Erbium-Doped Silicon-Carbide Nanowires towards Quantum Technologies Vasileios Nikas; State University of New York Polytechnic Institute, United States.

3:00 PM BREAK

SESSION ED1.11: Nanodiamonds for Quantum Technology and Sensing
Session Chair: Helena Knowles
Thursday Afternoon, April 20, 2017
PCC North, 100 Level, Room 128 B

3:30 PM ED1.11.01
Focused Ion Beam Implantation with Single Ion Detection for SiV Center Creation in Diamond Edward Bielejec; Sandia National Laboratories, United States.

3:45 PM *ED1.11.02
Optical Levitation of Nanodiamonds in Vacuum without Heating Gavin W. Morley; University of Warwick, United Kingdom.

4:15 PM ED1.11.03
Optimizing Structure in Nanocrystalline Diamonds Using *In Situ* Strain-Sensitive Bragg Coherent Diffraction Imaging F. Joseph Heremans[1, 2]; [1]Argonne National Laboratory, United States; [2]University of Chicago, United States.

4:30 PM ED1.11.04
Molecular Control of Nanodiamond Doping via a High Temperature, High Pressure Process Matthew Crane; University of Washington, United States.

4:45 PM ED1.11.05
Measuring Vacancies and Nitrogen-Vacancy Centers in Nanodiamonds Using Electron Energy Loss Spectroscopy in a TEM Shery Chang; Arizona State University, United States.