

Vita of  
**Jeffry Alan Kelber**

## **CONTACT INFORMATION**

Department of Chemistry  
1155 Union Circle, #305070  
University of North Texas  
Denton, TX 76203  
Phone: 940-565-3265  
Email: Jeffry.kelber@unt.edu

## **I. BACKGROUND**

### **Education**

1979 Ph.D. Inorganic Chemistry, U. of Illinois/Urbana (Advisor: Prof. G. D. Stucky)  
1975 B.Sc. Chemistry with Honors, Calif. Inst. of Technology

### **Professional Appointments**

2002-present, Regents Professor, Dept. of Chemistry, University of North Texas  
1997-2002, Professor, Department of Chemistry, University of North Texas  
1990-1997, Associate Professor, University of North Texas, Denton, TX  
1979-90, Member of Technical Staff, Sandia National Laboratories, Albuquerque, NM

### **Professional Activities**

2008-2016, Expert Panel Member, European Research Commission Advanced Grant Program  
2018-2020, Focus Topic Champion “Complex Oxides” American Vacuum Society  
2017-2019 Chair, Texas Chapter of the American Vacuum  
2019-2021, Member, Proposal Review Panel, Center for Functional Nanomaterials, Brookhaven National Laboratory  
2017-2021, External Reviewer, European Research Commission Horizon 2020 Future Emerging Technologies Program  
2021-2023; Member, Exec. Comm., Magnetic Interfaces and Nanostructures Division of the American Vacuum Society.  
2008-2016, Expert Panel Member, European Research Commission Advanced Grant Program  
Referee (journal articles) J. Appl. Phys., Appl. Phys. Lett., J. Phys. Chem. C, Nature, others  
Referee (proposals) U.S. DOE/BES, NSF, ERC (EU), ANR (France), DFG (Germany),

### **Honors and Recognition**

Inventor Recognition Award, Semiconductor Research Corp. (1998, 2004, 2010)  
Dekker Scholar, University of North Texas, 2003  
Regents Professor, University of North Texas, 2002-current

Dougherty Award (North Texas Chapter of the American Chemical Society) 2002  
Toulouse Scholar, University of North Texas, 2001

**Research interests: Surface science as applied to--**

Electrocatalysis

Heterogeneous catalysis

Surface and optical properties of oxides and oxynitrides

Germanium surface chemistry

**II. RESEARCH**

**II.-A. Publications from Present-2018 (a full list available upon request)**

**H index = 33 (Google Scholar)**

**(Corresponding author)**

207. Samar Alhowity, Kabirat Balogun, Ashwin Ganesan, Colton J. Lund, Olatomede Omolere, Qasim Adesope, Precious Chukwunenyne, Stella C. Amagbor, Fatima Anwar, M. K. Altafi, Francis D'Souza, Thomas R. Cundari, Jeffry A. Kelber “Niobium Carbide and Tantalum Carbide as Nitrogen Reduction Catalysts: Catalytic Activity, Carbophilicity, and the Importance of Intermediate Oxidation States”, *ACS Applied Materials and Interfaces* (accepted for publication).
206. Olatomide Omolere, Samar Alhowity, Qasim Adesope, Tochi L. Agbarra, Jeffry A. Kelber “ Germanium surface cleaning and ALD of a protective boron nitride overlayer”, *J. Vac. Sci. and Technol. A.* 41 (2023) 062411
205. Precious Chukwunenyne, Ashwin Ganesan, Mojgan Gharaee, Kabirat Balogun, Qasim Adesope, Stella Chinelo Amagbor, Teresa D. Golden, Francis D'Souza, Thomas R. Cundari and Jeffry A. Kelber, “Stability and activity of titanium oxynitride thin films for the electrocatalytic reduction of nitrogen to ammonia at different pH values”, *Phys. Chem. Chem. Phys.* **25** (2023) 19540-19552
204. Ashwin Ganesan, Samar Alhowity, Ajyal Z. Alsaleh, Manan Guragain, Olatomide Omolere, Thomas R. Cundari, Jeffry Kelber, Francis D'Souza, “Electro- and Photocatalytic Conversion of N<sub>2</sub> to NH<sub>3</sub> by Chemically Modified Transition Metal Dichalcogenides, MoS<sub>2</sub>, and WS<sub>2</sub>”, *J. Electrochem. Soc.* **170** (2023) 056501
203. [Invited]Kabirat Balogun, Ashwin Ganesan, Precious Chukwunenyne, Mojgan Gharaee, Qasim Adesope, Slavomír Nemšák, Paul S. Bagus, Thomas R. Cundari, Francis D'Souza, and Jeffry A. Kelber\*, “Vanadium Oxide, Vanadium Oxynitride, and Cobalt Oxynitride as Electrocatalysts for the Nitrogen Reduction Reaction: A Review of Recent Developments”, *J. Phys C: Cond. Matter* **35** (2023) 33302

202. [INVITED BOOK CHAPTER] S. Alhowity, O. Omolere, J. Du and J. A. Kelber “Aspects of O radical interactions with surfaces: effects of relative flux and kinetic energy” in Dynamic Processes in Solids, J. E. House (ed). (Elsevier; Amsterdam) 2023 pp 185-206 DOI: <https://doi.org/10.1016/B978-0-12-818876-7.00013>
201. Precious Chukwunenye, Ashwin Ganesan, Mojgan Gharaee, Kabirat Balogun, Fatima Anwar, Qasim Adesope, Thomas R. Cundari, Francis D’Souza, and Jeffry A. Kelber, “Electrocatalytic Selectivity for Nitrogen Reduction vs. Hydrogen Evolution: A Comparison of Vanadium and Cobalt Oxynitrides at Different pH Values”, *J. Mater. Chem. A.* **10** (2022) 21401-21415 accepted for publication, 9/12/22 DOI: 10.1039/D2TA05180J
200. K. Balogun, P. Chukwunenye, F. Anwar, A. Ganesan, Q. Adesope, D. Willadsen, S. Nemšák, T. R. Cundari, P. S. Bagus, F. D’Souza, J. A. Kelber, “Interaction of molecular nitrogen with vanadium oxide in the absence and presence of water vapor at room temperature: Near-ambient pressure XPS” *Journal of Chemical Physics* **157** (2022) 104701 ; DOI; 10.1063/5.0107678
199. Adaeze Osonkie, Ashwin Ganesan, Precious Chukwunenyne, Fatima Anwar, Kabirat Balogun, Mojgan Gharaee, Ishika Rashed, Thomas R. Cundari, Francis D’Souza, and Jeffry A. Kelber, “Electrocatalytic Reduction of Nitrogen to Ammonia: the Roles of Lattice O and N in Reduction at Vanadium Oxynitride Surfaces”, *ACS Applied Materials and Interfaces* **14** (2022) 531-42 DOI 10.1021/acsami.1c16104
198. Ashwin Ganesan, Adaeze Osonkie, Precious Chukwunenyne, Ishika; Rashed, Thomas R. Cundari, Francis D’Souza, Jeffry A. Kelber, Communication—Electrochemical Reduction of N<sub>2</sub> to Ammonia by Vanadium Oxide Thin Films at Neutral pH: Oxophilicity and the NRR Reaction. *Journal of the Electrochemical Society*, **168** (2021) 26504 DOI 10.1149/1945-7111/abde7f
197. Sathish Rajendran, Aparna Pilli, Olatomide Omolere, Jeffry Kelber. Leela Mohana Reedy Arava “An All-Solid-State Battery with a Tailored Electrode-Electrolyte Interface Using Surface Chemistry and Interlayer-Based Approaches, *Chemistry of Materials* **33** (2021) 3401-3412
196. Aparna Pilli, Veronica Lee, Jessica Jones, Natasha Chugh, Jincheng Du, Frank Pasquale, Adrien LaVoie, Jeffry Kelber “Influence of O(<sup>3</sup>P)/O<sub>2</sub> flux on the atomic layer deposition of B<sub>2</sub>O<sub>3</sub> using trimethyl borate at room temperature” *J. Phys. Chem. C.* **124** (2020) 25846-25848 (accepted for publication, 11/3/2020). DOI: 10.1021/acs.jpcc.0c07586
195. Adaeze Osonkie, Veronica Lee, Adeola Oyelade, Maximillian Mrozek-McCourt, Precious Chukwunenyne, Teresa D. Golden, Thomas R. Cundari, Jeffry A. Kelber

“Chemical and electronic structures of cobalt oxynitride films deposited by NH<sub>3</sub> vs. N<sub>2</sub> plasma: theory vs. experiment” *Phys. Chem. Chem. Phys.* **22** (2020) 24640-24648 DOI 10.1039/D0CP04168H )

194. A. Osonkie, V. Lee, P. Chukwunenye, T. Cundari, J. A. Kelber, “Plasma Modification of Vanadium Oxynitride Surfaces: Characterization by In-situ XPS Experiments and DFT Calculations”, *J. Chem. Phys.* **153** (2020) 144709 DOI 10.1063/5.0027996)
193. Calley N Eads, Jian-Qiang Zhong, Donghun Kim, Nusnin Akter, Zhihengyu Chen, Angela M Norton, Veronica Lee, Jeffry A Kelber, Michael Tsapatsis, J Anibal Boscoboinik, Jerzy T Sadowski, Percy Zahl, Xiao Tong, Dario J Stacchiola, Ashley R Head, Samuel A Tenney “Multimodal surface analysis of porous films under operando conditions” *AIP Adv.* **10** (2020) 085109 DOI 10.1063/5.0006220
192. Jessica C. Jones, Sathish Rajendran, Aparna Pilli, Veronica Lee, Natasha Chugh, Leela Mohana Reddy Arava, Jeffry A. Kelber. “In-situ XPS study of lithium carbonate removal from garnet-type solid-state electrolyte using ultra high vacuum techniques” *J. Vac. Sci. and Technol. A* **38** (2020) 023201 DOI: 10.1116/1.5128102 (accepted, 12/13/2019)
191. Adeola Oyelade , Adaeze Osonkie , Andrew J Yost , Nicole Benker , Peter A Dowben and Jeffry A Kelber, Optical, electronic and visible-range photo-electronic properties of boron carbide-indole films, *J. Phys. D. Appl. Phys.* **53** (2020) 355101 <https://doi.org/10.1088/1361-6463/ab8e7e>
190. Chad Ladewig, Fatima Anwar, Veronica Lee, Jeffry A. Kelber, Syed Q. A. Shah and Peter A. Dowben, “Ultrathin Chromia on a Hexagonally-Ordered d<sup>0</sup> Ferromagnet: Evidence of Interfacial Exchange Bias at the Cr<sub>2</sub>O<sub>3</sub>/TiO<sub>2-x</sub> Interface. *Langmuir* **35** (2019) 14797-14803 (published on line 11/8/2019) DOI: 10.1021/acs.langmuir.9b02654
189. Jessica Jones, Aparna Pilli, Veronica Lee, John Beatty, Brock Beauclair, Natasha Chugh, Jeffry Kelber, “Atomic Layer Deposition of h-BN(0001) Multilayers on Ni(111) and Chemical Vapor Deposition of Graphene on h-BN(0001)/Ni(111), *J. Vac. Sci. and Technol A.* **37** (2019) 060903 DOI: 10.1116/1.5120628
- 188 Aparna Pilli, Jessica Jones, Natasha Chugh, Jeffry Kelber, Adrien LaVoie and Frank Pasquale. “Atomic layer deposition of BN as a novel capping barrier for B<sub>2</sub>O<sub>3</sub>”, *J. Vac. Sci. and Technol. A.* **37**, 041505 (2019)) DOI: 10.1116/1.5092806
187. O. Opeyemi. Chad Ladewig and J. A. Kelber, “Graphene/Graphene Oxide Heterostructures on Polar Oxide Substrates” in Computational Materials, Chemistry, and Biochemistry: From Bold Initiatives to the Last Mile In Honor of William A. Goddard’s Contributions to Science and Engineering (Springer Series in Mat. Sci.). S.

Shankar, R. Muller, T. Dunning and G. H. Chen (eds.) Springer, NY (2019) ISBN 978-3-030-18778-1

- 186, Nicole Benker, George Peterson, Yaroslav Burak, Ben Bradley, Ethiyal Wilson, James Petrosky, John McClory, Jeffry Kelber, Jennifer Hamblin, Scott Tarry, Peter A. Dowben, Axel Enders, and Elena Echeverria, “Passive Detection of Slow Solar Neutrons Using Boron Based Materials” *Radiation Measurements* **129** (2019) 106190  
<https://doi.org/10.1016/j.radmeas.2019.106190>
185. Aparna Pilli, Jessica Jones, Veronica Lee, Natasha Chugh, Jeffry Kelber, Adrien LaVoie, Frank Pasquale, “*In situ* XPS study of low temperature atomic layer deposition of  $B_2O_3$  films on Si using  $BCl_3$  and  $H_2O$  precursors”, *J. Vac. Sci. and Technol. A* **36** (2018) 0615003 DOI: 10.1116/1.5044396
184. Adeola Oyelade, Andrew J. Yost, Nicole Benker, Bin Dong, Sean Knight, Mathias Schubert, Peter A. Dowben, Jeffry A. Kelber “Composition-Dependent Charge Transport in Boron Carbides Alloyed with Aromatics: Plasma Enhanced Chemical Vapor Deposition Aniline/Orthocarbon Film” *Langmuir* **34** (2018) 12007-12016 DOI: 10.1021/acs.langmuir.8b02114 (2018)
183. Michael Nastasi, George Peterson, Qing Su, Yongqiang Wang, N. J. Ianno, Nicole Benker, Elena Echeverria, Andrew J. Yost, J. A. Kelber, B. Dong, Peter A. Dowben “Electrical and Structural Characterization of Neutron Irradiated Amorphous Boron Carbide/Silicon p-n Heterojunctions” *Nucl. Inst. And Methods in Physics Research B* **432** (2018) 48-54 DOI: 10.1016/j.nimb.2018.07.006
182. Chad Ladewig, Tao Cheng, Michael D Randle, Jonathan Bird, Opeyemi Olanipekun, Peter A. Dowben, Jeffry Kelber, and William A. Goddard III. “Ordered Three-fold Symmetric Graphene Oxide/Buckled Graphene/Graphene Heterostructures on  $MgO$  (111) by Carbon Molecular Beam Epitaxy”, *J. Mater. Chem. C.* **6** (2018) 4225-4233
181. Bin Dong, E. Echeverria, A. Oyelade, D. Converse, J. Silva, J. M. Rimsza, J. Du, M.S. Driver, Benjamin Hayworth, Nan Shao, Yi Gao, Wai-Ning Mei, P. A. Dowben, J. A. Kelber “Chemical and electronic structure of composite films deposited by plasma-enhanced chemical vapor deposition from orthocarbon and pyridine source compounds” *J. Electron Spectr. And Rel. Phenom.* **223** (2018) 21-28
181. [INVITED Book Chapter] Jeffry A. Kelber, Jessica Jones, Aparna Pilli and Brock Beauclair, “Graphene/Boron Nitride Heterostructures: Direct Growth by Practical and Industrially Scalable Methods”, (2018) *Elsevier Reference Module in Chemistry, Molecular Sciences and Chemical Engineering* (<https://doi.org/10.1016/B978-0-12-409547-2.12922-1>)

## **II.-B. Patents**

### **(1) Film for use in microelectronic devices and methods of producing same**

US Patent 6,306,495

Inventor; Jeffry A. Kelber

Date: Oct. 23, 2001

Filed: July 27, 2000

### **(2) Method of adhesion between an oxide layer and a metal layer**

US Patent 6,306,495

Inventors: Dwight Jennison, Alexander Bogicevic, Jeffry Kelber, Scott Chambers

Date: September 14, 2004

Filed : May 21, 2002

### **(3) Conductor structures including penetrable materials (*relates to I-mediated Cu electrodeposition on Ru. SRC inventor recognition award*)**

US Patent 7,534,967

Inventors: Jeffry A. Kelber, Jipu Lei, Noel P. Magtoto, Sergei Rudenja

Date: May 19, 2009

Filed: Feb. 24, 2004

### **(4) Coherent spin field effect transistor**

Inventors: Jeffry Kelber, Peter A. Dowben

US Patent 8,748,957

Date: June 10, 2014

Filed: January 5, 2012

### **(5) Semiconducting alloy polymers formed from orthocarborane and 1,4-diaminobenzene**

US Patent 9,324,960

Inventors: Peter Dowben and Jeffry Kelber

Date: April 26, 2016

Filed June 4, 2012

**(6) Boron carbide films exhibits extraordinary magnetoconductance and devices based thereon**

US Patent 9,324,938

Inventors; Jeffry Kelber, Peter Dowbern

Date; April 26, 2016

Filed; December 6, 2013

**(7) Magneto-electric voltage controlled spin transistors**

US Patent 9,379,232

Inventors: Jeffry A. Kelber, Christian Binek, Peter A. Dowben, Kirill, Belaschenko

Date: June 28, 2016

Filed: Feb. 18, 2014

**(8) Graphene magnetic tunnel junction spin filters and methods of making**

US Patent 9,564,579

Inventors: Jeffry A. Kelber, Zhou Mi

Date: Feb. 7, 2017

Filed: May 25, 2012

**(9) Direct graphene growth on metal oxides by molecular epitaxy**

US Patent 9,624,600

Inventor: Jeffry A. Kelber

Date: April 18, 2017

Filed: December 6, 2012

**(10) Manufacturable spin and spin-polaron interconnects**

US Patent 9,761,660

Inventor: Jeffry A. Kelber

Date: Sept. 12, 2017

Filed: Jan. 27, 2015

**II.-C. Current External Research Grants (as of 1/17/2024)**

**(1) NSF: Metal Oxynitrides: Tuning Metal-N and Metal-O**

*Interactions for Improved Electrocatalytic Properties at the Liquid/Solid Interface* (PI; co-PIs F. D'Souza and T. R. Cundari, UNT Chemistry) 08/1/2021-7/31/2024 Total Amount: \$498,943

**(2) R. A. Welch Foundation:** *Collaborative Research: Sustainable Ammonia Production from Nitrogen via Electrochemical and Photochemical Methods* (co=PI; PI = F. D'Souza, co-PI= T. R. Cundari (UNT Chemistry) 06/1/2023-05/30/2024 Total Amount: \$300,000 no IDC

**(3) NASA:** *Protective Thermal and Electro-Chromic Coatings (PROTECC) for Lunar Exploration* (co-PI; PI= Prof. Z. Zhang, UNT Mech. Eng., co-PI=J. Beatty, TWU Chem.) 08/1/2023 – 07/31/2026 Total Amount: \$899,999

**(4)ACS-PRF New Directions:** *Transition-Metal Carbides for Fischer-Tropsch Catalysis: Surface Oxygen and Metal Oxophilicity* (PI: co-PI = Shengqian Ma, UNT Chemistry) 09/1/2023 – 08/31/2025 Total Amount: \$110,000 no IDC

**(5) AFOSR:** *High-Contrast Elasto-Metamaterial Photonics for Adaptable yet Stable Lasing* (co-PI: PI= Prof. Z. Zhang, UNT Mech Eng.; co-PIs Jens Neu and A. Krokhin, UNT. Phys.; T.Chi, UNT Mech. Eng.) 09/1/2023 – 08/31/2026 Total Amount: \$4,437,624

**(6)DOD HBCU Initiative:** *Tunable Plasmonic Multispectral Metasurfaces* (co-PI: PI = Prof. Z. Zang, UNT Mech Eng.) 07/1/2023-06/31/2027 Total Amount: \$799,999

### **III-D. Graduate Students Completing PH.D.**

Since joining UNT in 1990, 38 graduate students have completed their PH.D. under Prof. Kelber. A detailed list is available upon request.