# Jun Qu, Ph.D.

Group Leader, Distinguished R&D Staff

Surface Engineering & Tribology Group

Oak Ridge National Laboratory (ORNL**)**

Fellow, STLE

*Google scholar citations*: 6600+, *h*-index: 44

P.O. Box 2008, MS 6063

Oak Ridge, TN 37831

Phone: (865) 576-9304 (office)

E-mail: qujn@ornl.gov

*Standardized citation metric*: Top 100,000 of the most-cited scientists across all fields, 2019

**EDUCATION**

* Ph.D. 5/2002 Major: *Mechanical Engineering*, Minor: *Electrical Engineering*,

 North Carolina State University, Raleigh, North Carolina

* M.S. 8/1999 *Mechanical Engineering*, Iowa State University, Ames, Iowa
* M.E. 3/1998 *Precision Instrument Engineering*, Tianjin University, China
* B.S. 7/1995 *Precision Instrument Engineering*, Tianjin University, China

### EXPERIENCE

* **11/2021 – present *Group Leader*, Surface Engineering & Tribology Group, Materials Science & Technology Division (MSTD), ORNL**
* 10/2020 – 10/2021 *Group Leader*, Materials Processing Group, MSTD, ORNL
* **01/2016 – present *Distinguished R&D Staff*, MSTD, ORNL**
* 10/2011 – 12/2015 *Senior R&D Staff*, MSTD, ORNL
* 01/2007 – 9/2011 *R&D Staff,* MSTD, ORNL
* 02/2004 – 12/2006 *Associate R&D Staff*, Metals & Ceramics Division (M&C), ORNL
* 05/2002 – 2/2004 *Postdoctoral Research Associate*, M&C, ORNL

**RESEARCH**

* ***Current Interests***:
	+ Eco-friendly, energy-efficient **Lubrication**
	+ Superlubricity and wear resistant **Surface Engineering**
	+ **Nanomaterials processing** for sealing and thermal management
	+ **Manufacturing** for tribological applications
	+ **Interfacial Phenomena** with combined mechanical, thermal, and chemical interactions
* ***Goals***: Improved energy efficiency and sustainability with reduced environmental impact
* ***Applications***: Automotive (both IC and EV), concentrating solar power, biomass preprocessing, hydropower, hydraulics, HVAC, and nuclear

### HONORS

* **Fellow**, ***Society of Tribologists & Lubrication Engineers* (STLE)** since 2017
* **2022 R&D 100 Award Finalist** (Team Lead), jointly with Danfoss, A high-efficiency carbon nanotube-coated mesh seal, *R&D Magazine*
* **2020 Distinguished Researcher Award**, Recognition of sustained and distinguished accomplishments with high impact in science and engineering, *ORNL/UT-Battelle Awards Night* (ORNL Highest Researcher Award, limited to 2 awardees per year and once for the career)
* **2020 R&D 100 Award Finalist** (Team Lead), A superlubricity coating composed of vertically aligned carbon nanotubes, *R&D Magazine*
* **2014 R&D 100 Award** (Team Lead), jointly among ORNL, GM, Shell, and Lubrizol, Ionic liquid anti-wear additives for fuel-efficient engine lubricants, *R&D Magazine*
* **2014 DOE Vehicle Technologies Office R&D Award**, Development of novel ionic liquid engine oil additives with potential to deliver a 2% fuel economy improvement, *U.S. Depart. of Energy*
* **2009 SME Outstanding Young Manufacturing Engineer Award**, Recognition of significant achievement & leadership in manufacturing engineering, *Society of Manufacturing Engineers*
* 2015 Invited Attendee to U.S. NAE Frontiers of Engineering Symposium, *National Academy of Engineering (NAE)*
* 2015 ORNL Significant Event Award, Discovery and fundamental understanding of incompatibility between diamond-like-carbon coatings and lubricant additives provide new insights for future materials development
* 2014 ORNL Significant Event Award, Development of lubricant that meets DOE goal of 2 percent vehicle fuel economy improvement
* 2011 ORNL Significant Event Award, Breakthrough in ionic liquid lubricants recognized by a major DOE program award
* ORNL Performance Awards2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2021
* **1999 NAMRC Outstanding Paper Award Finalist**, *SME North American Manufacturing Research Conference*

**MEDIA REPORTS**

1. “ORNL’s latest on bio-oils corrosion and degradation: The Digest’s 2020 multi-slide guide to Oak Ridge National Laboratory,” *Biofuels Digest*, Jan. 10, 2021.
2. “ORNL team shows using ionic liquid as lubricant additive improves gear performance,” *Green Car Congress*, Sept. 8, 2019.
3. Featured at Frontiers of Engineering Alumni Spotlight, *National Academy of Engineering (NAE),* June 17, 2019.
4. “Finding Alternatives to ZDDP,” *Lubes ’n’ Greases*, November 2018, p. 44-48.
5. “ORNL, Shell develop a less friction/wear hybrid lubricant additive,” *World Industrial Reporter*, Sept. 2, 2015.
6. “Reduce wear with synergistic lubricant pair,” *Materials Views*, July 28, 2015.
7. “Low-friction engine oil,” *R&D Magazine*, August 19, 2014.
8. “National lab: New oil additive saves 2% on gas,” *USA Today,* July 28, 2014.
9. “Lab rolls out ideas for future vehicles,” *Detroit Free Press,* July 27, 2014.
10. “Oak Ridge-GM prototype low-viscosity ionic liquid-additized engine oil delivers 2% fuel economy improvement over 5W-30,” *Green Car Congress*, Dec. 30, 2013.
11. “Molten salts could improve fuel economy,” *Inside Science News*, Nov. 15, 2013.
12. “Lubricating titanium,” *Tribology & Lubrication Technology,* Nov. 2012.
13. “Unleashing the potential of ionic liquids,” *Tribology & Lubrication Technology,* Apr. 2010.
14. “Nanocoatings boost industrial energy efficiency,” *Science Daily*, Nov. 2008.
15. “Supersaturated steel could save energy in factories,” *Science Daily*, Aug. 2007.

**AFFILIATIONS AND PROFESSIONAL ACTIVITIES**

* Professional Societies
	+ ***Fellow***, **Society of Tribologists & Lubrication Engineers** (**STLE**), 2017–present
	+ **Wear of Materials***Board of Directors*, 2019–present
	+ **STLE** *Fellows Committee*, 2022–present
	+ **SAE** *Fuels and Lubricants TC 3 Driveline and Chassis Lubrication Committee*, 2022–present
	+ **ASTM International***, G2 on Wear and Erosion and* *D2 on Petroleum Products, Liquid Fuels, and Lubricants*,2017–present
* Conference Organizing
	+ **Conference Chair**, ***24th International Conference on Wear of Materials***, Banff, Canada, April 16–20, 2023 (WoM 2023)
	+ ***STLE Annual Meeting Planning Committee*** *(AMPC)*, 2019–present
	+ Program Chair, *23rd International Conference on Wear of Materials*, Virtual, April 25–29, 2021 (WoM 2021)
	+ Organizing Committee/Associate Editor, *17th, 21st and 22nd International Conference on Wear of Materials*, 2009, 2017, and 2019.
	+ Organizer, Symposium for Hardfacing Coatings for Wear and Corrosion Resistance Applications, *Materials Science & Technology (MS&T) 2010 and 2012*.
* Journal Editing
	+ *Associate Editor*, **ASME Journal of Tribology**, 2020–present
	+ *Associate Editor*, **Friction**, 2020–present
	+ *Associate Editor*, **Lubricants**, 2017–present
		1. Editor, Special Issue *Advanced Lubrication for Energy Efficiency II,* 2020–21
		2. Editor, Special Issue *Advanced Lubrication for Energy Efficiency,* 2018
	+ *Associate Editor*, **Frontiers in Mechanical Engineering**, 2015–present
		1. Co-Editor, Special Issue *Ionic Liquids in Tribology*, 2020–21.
		2. Editor, Special Issue *Advanced Tribology and Lubrication: From Nanoscale Phenomena to Real World Applications,* 2018–19.
	+ *Key Reader*, Metallurgical and Materials Transactions A, 2013–2022
	+ *Technical Editor*, Tribology & Lubrication Technology, 2009–14.
* Government
	+ U.S. Representative, **International Energy Agency (IEA)** *Advanced Materials for Transportation (AMT) Technology Collaboration Programme (TCP)*, 2022–present
	+ **U.S. DoD** *Military Vehicle Industry Consortium (MVIC) on Fluid Modernization*, 2020–present
	+ U.S. DOE *Lubricants Working Group*, 2015–18
	+ National Academy of Engineering (NAE)’s *2015 U.S. NAE Frontiers of Engineering Symposium*

**SELECTED RESEARCH PROJECTS**

* *Eco-friendly, energy-efficient* ***Lubrication***
1. Organic-modified CNTs as lubricant additives for enhanced lubricity and thermal management of EVs (PI, DOE VTO 2022-24; CRADA w/ Valvoline)
2. Eco-friendly high-lubricity ionic liquids for hydraulic and hydropower lubrication (DOE VTO LabCall 2018-20; DOE WPTO Seedling 2021 & Sapling 2022; ORNL TIP 2020-22, collaboration w/ Solvay and Driven Racing Oil)
3. Ionic liquids as novel lubricant additives for HVAC compressors for enhanced efficiency and durability (PI, DOE TCF CRADA w/ Trane, 2021-22)
4. Tribocorrosion in molten salts for concentrating solar power and nuclear reactors (Task PI, DOE NE 2020-2021; DOE SETO FOA 2018-20, collaboration w/ Hayward Tyler)
5. Organic-modified nanoparticles and metal-complexes as additives for low-viscosity lubricants (DOE VTO FOA 2015-17 collaboration w/ UTK, UCM, and Cool-X; Hyundai 2019-20)
6. Ionic liquids as novel lubricant additives for automotive applications (PI, ORNL Seed 2005-06; DOE CRADA w/ GM 2009-13; DOE FOA CRADA w/ Shell 2012-15; DOE VTO FOA w/ GM 2015-19)
7. Investigation of the wear mechanism of sooted engine oils (PI, DOE w/ Cummins 2016-18)
8. Compatibility of between lubricant additives and non-ferrous alloys/coatings (PI, DOE VTO 2013-18)
9. Hyperbranched polymers for improved viscosity and lubricity (co-PI, DOE VTO FOA w/ PNNL 2014-16)
10. Diesel fuel injector lubrication and scuffing in ultra-low sulfur fuels (co-PI, DOE VTO 2002-05)
11. Effects of engine oil aging on friction and wear behavior (co-PI, DOE VTO 2002-05)
* *Superlubricity and wear resistant* ***Surface Engineering***
1. Superlubricity carbon nanotube (CNT) coating (PI, ORNL Seed 2018-19, DOE VTO 2022-24)
2. Wear resistant coatings for improving the durability of biomass comminution equipment (PI, Task 1 Lead of DOE BETO Feedstock-Conversion Interface Consortium 2018-24, collaborations among multiple national labs (ORNL, INL, ANL, and NREL) and a number of industrial partners including Forest Concepts, Rawlings Manufacturing, Eberbach, etc.)
3. Grid-to-rod fretting of candidate accident-tolerant fuel cladding materials and coatings (DOE NE CASL 2014-17; FOA 2018-20, collaboration with Westinghouse and General Atomics)
4. Advanced heavy-duty diesel engine piston skirt coatings (PI, DOE VTO CRADA w/ Cummins 2015-16)
5. Surface texturing for friction and wear reduction (PI, DOE VTO 2014)
6. Ionic liquids-processed anti-corrosion coatings for Mg alloys (PI, ORNL Seed 2012-14)
7. Nanostructured superhydrophobic coatings for drag reduction and anti-corrosion (PI, DOE ITP FOA w/ Ross Tech and SIT 2009-12)
8. Development of AlMgB14-based nanostructured superhard coatings for hydraulic and tooling systems (co-PI, DOE ITP FOA CRADA w/ Eaton, Ames Lab, and Greenleaf 2007-10)
9. Friction stir-based surface nanocompositing process for aluminum alloys (PI, ORNL LDRD 2006-08)
10. Low-temperature colossal carbon supersaturation for austenitic stainless steels (co-PI, DOE ITP FOA w/ Swagelok and CWRU 2005-08)
11. Surface engineering of titanium alloys for diesel engine and brake applications (PI, DOE VTO 2004-08)
* ***Nanomaterials Processing*** *for energy storage and thermal management*
1. Carbon nanotubes (CNTs) for friction and thermal management for electric vehicles (EVs) (PI, DOE VTO 2022-24)
2. CNTs-based high-efficiency seals for turbomachinery for concentrating solar power (PI, DOE SETO FOA award w/ Danfoss 2020-23).
3. Processing high-quality, low-defect TiO2 nanotubes using ionic liquids for Li-ion batteries & photoelectrochemical water splitting (PI, DOE ITP FOA 2009-11)
4. Development of a self-aligned Cu-Si core-shell nanowire array as a novel anode for Li-ion batteries (PI, ORNL Seed 2010-11)
* ***Manufacturing***
1. Laser melting and binder jetting to produce novel tribological materials and structures for automotive (PI, Ford Alliance 2018-20)
2. Additive manufacturing of wear-resistant composite coatings for military applications (PI, DOD AMRDEC 2017)
3. Thermal drilling of lightweight alloys (co-PI, DOE VTO w/ U Michigan 2005-07)
4. High-speed titanium machining (co-PI, DOE VTO w/ TWS and U Michigan 2004-06)
5. Grindability of ceramics and TiC-Ni3Al composites (co-PI, DOE VTO w/ LSU 2005)
6. Development of cylindrical wire electrical discharge machining of metals and MMCs (NC State, Ph.D. dissertation 1999-2002)

**RESEARCH GRANTS** (*43 grants of $28M including 22 collaborated with industry, lead-PI for 31 grants of $19M*)

* + 1. J. Qu (PI), G. Fenske (ANL), J. Lacey (INL), J.R. Keiser, V. Thompson (INL), “Understand and mitigate equipment wear in preprocessing,” DOE EERE BETO FCIC 2.1 Task 1, $1,725,000 ($696,000 to ORNL), 2022-24.
		2. J. Qu (PI), C. Kumara, H. Wang, “Carbon nanotube (CNT) coatings for superlubricity & thermal management of HD EVs,” DOE EERE VTO, $450,000, 2022-23.
		3. J. Qu (PI), C. Kumara, H. Wang, “New lubricant strategies for advanced thermal management of HD EVs,” CRADA with Valvoline, DOE EERE VTO, $450,000, 2022-23.
		4. J. Qu (PI), T. Mathews, H.M. Luo, “Novel eco-friendly high-lubricity ionic liquids for marine turbomachinery lubrication,” Collaboration with Driven Racing Oil and Solvay, DOE EERE WPTO Marine Energy Sapling (competitive solicitation), $250,000, 2022-23.
		5. J. Qu (PI), T. Li (Danfoss PI), M.B. Dobrica (Danfoss), C. Kumara, “Vertically-aligned carbon nanotube arrays as novel self-lubricating high-efficiency brush seal for CSP turbomachinery,” Collaboration with Danfoss, DOE EERE SETO DE-FOA-0002064 (competitive solicitation), $1,400,000 ($897,000 to ORNL), 2020-23.
		6. J. Qu (PI), J.R. Keiser, G. Fenske (ANL), D.N. Lanning (Forest Concepts), “Investigating and addressing the wear issue of the rotary shear biomass comminution system,” CRADA with Forest Concepts, DOE EERE BETO FCIC DFO (competitive solicitation), $1,200,000 ($900,000 to ORNL), 2019-23.
		7. J. Qu (PI), W. Akram (Trane), H.M. Luo, E. Sorenson (Trane), “Ionic liquids as novel lubricant additives for HVAC compressors for enhanced efficiency and durability,” CRADA with Trane, DOE OTT Technology Commercialization Fund (TCF, competitive solicitation), $225,000, 2021-23.
		8. J. Qu (Task lead), “Grid-to-rod fretting of candidate accident-tolerant fuel claddings,” Collaboration with Westinghouse Electric and General Atomics, DOE NE FOA, $440,000, 2018-22.
		9. J. Qu (PI), H.M. Luo, T. Mathews, X. He, “Eco-friendly, high-lubricity ionic liquids as lubricant additives for hydraulics,” Collaboration with Driven Racing Oil and Solvay, ORNL Technology Innovation Program (TIP, competitive solicitation), $200,000, 2020-22.
		10. B. Cook (Novus, PI), J. Qu, "Advanced coatings for improved diesel engine durability and efficiency," Collaboration with Novus, DOE SBIR DE-FOA-0001941, $150,000 ($49,000 to ORNL), 2020-22.
		11. J. Qu (PI), H.M. Luo, T. Mathews, “Novel eco-friendly high-lubricity ionic liquids for marine turbomachinery lubrication,” DOE EERE WPTO Marine Energy Seedling (competitive solicitation), $50,000, 2021.
		12. J. Qu (PI), J.R. Keiser, J. Lacey (INL), V. Thompson (INL), G. Fenske (ANL), “Understand and mitigation equipment wear in preprocessing,” DOE EERE BETO FCIC Task 1, $2,008,000 ($724,000 to ORNL), 2019-21.
		13. J. Qu (PI), “Organic-modified nanoparticles and metal-complexes as novel additives for low-viscosity lubricants,” Hyundai Motors, $370,800, 2019-21.
		14. B.G. Hardy (Hayward Tyler PI), K.R. Robb (ORNL PI), J. Qu, J.R. Keiser, D.L. Barth (HTSD), “Development of high-temperature molten salt pump technology for gen3 solar power tower systems,” Collaboration with Hayward Tyler, DOE EERE SETO FOA (competitive solicitation), $2,000,000 ($1,100,000 to ORNL), 2018-21.
		15. G. Fenske (ANL PI), J. Qu (ORNL PI), L. Cosimbescu (PNNL PI), “High performance fluids and coatings to improve efficiency, productivity, durability, and environmental compatibility of off-road hydraulic components,” DOE EERE VTO LabCall (competitive solicitation), $1,965,000 ($491,250 to ORNL), 2018-20.
		16. J. Qu (PI), Hamed Ghaednia (Ford), Arup Gangopadhyay, (Ford), A.M. Elliott, R.R. Dehoff, “Additive manufacturing opportunities to reduce friction and wear of engine components,” CRADA with Ford, Ford Alliance Program, $400,000, 2018-20.
		17. R. Elander (NREL PI), J. Qu (co-lead), J.R. Keiser, E. Kuhn (NREL), G. Fenske (ANL), “Understand and mitigation equipment wear in low-temperature pre-conversion,” DOE EERE BETO FCIC, $287,000 ($152,000 to ORNL), 2019.
		18. J. Qu (PI), M.B. Viola (GM PI), H.M. Luo, T.J. Toops, “Development of ionic liquid-additized, GF-5/6 compatible low-viscosity oils for automotive engine and rear axle lubrication for 4% improved fuel economy,” Collaboration with GM and Driven Racing Oil, DOE EERE VTO and DOD TARDEC DE-FOA-0000991 (competitive solicitation), $1,276,000 ($1,085,000 to ORNL), 2015-19.
		19. J. Qu (PI), P. Menchhofer (co-lead), “CNT-modified oleophilic surfaces for lubricant-starved applications,” ORNL LDRD Seed (competitive solicitation), $190,000, 2018-19.
		20. G. Muralidharan (PI), J.A. Haynes, D.N. Leonard, B.A. Pint, J. Qu, H. Wang, “Low-cost, high strength Ni-Fe-Cr alloys for high temperature applications,” ORNL TIP (competitive solicitation), $190,000, 2018-19.
		21. J.R. Keiser (PI), J. Qu (co-lead), “Investigation of machinery wear in biomass pre-processing and pre-conversion,” DOE EERE BETO FCIC, $400,000, 2018.
		22. J. Qu (PI), “Surface analysis of tribological films,” Shell Global Solutions, $50,000, 2018.
		23. J. Qu (PI), “Compatibility of lubricant additives with non-ferrous bearing alloys and coatings,” DOE EERE VTO, $1,000,000, 2013-18.
		24. J. Qu (PI), Y. Zhou, “Investigation of the wear mechanism of sooted engine oils,” Collaboration with Cummins, DOE EERE VTO, $75,000, 2017-18.
		25. J. Qu (PI), “Wear-resistant composite coatings replacing Cr-plating,” DOD AMRDEC, $110,000, 2017.
		26. B. Zhao (UTK PI), J. Qu (co-lead), A. Martini (UCM), S. Dai, H.M. Luo, B. Armstrong, “Hybrid ionic-nano-additives for engine lubrication to improve fuel efficiency,” DOE EERE VTO DE-FOA-0000988 (competitive solicitation), $898,000 ($280,000 to ORNL), 2015-17.
		27. J. Qu (Task lead), P.J. Blau, “Grid-to-rod fretting testing and modeling” Collaboration with Westinghouse Electric, DOE NEO CASL, $1,000,000, 2014-17.
		28. D. Leith (Cool-X PI), J. Qu (co-lead), B.H. West, “Nanodiamond lubricant additives,” Collaboration with Cool-X, DOE EERE VTO Voucher (competitive solicitation), $100,000 (all to ORNL), 2016-17.
		29. J. Qu (Task lead), R. England (Cummins), G. Muralidharan, “Investigating and addressing wear in a lightweight heavy-duty diesel engine,” Collaboration with Cummins, DOE EERE VTO, CRADA, $250,000, 2015-16.
		30. L. Cosimbescu (PNNL PI), J. Qu, P. Bhattacharya (PNNL), T. Bays (PNNL), S. Sluder, “Modified temperature-responsive hyperbranched polymers for improved viscosity and enhanced lubricity,” DOE EERE VTO DE-FOA-0000793 (competitive solicitation), $1,000,000 ($100,000 to ORNL), 2014-16.
		31. J. Qu (PI), B.L. Papke (Shell), B.G. Bunting, P.J. Blau, S. Dai, H.M. Luo, C. Chen (Shell), “Ionic liquids as multi-functional lubricant additives to enhance engine efficiency,” CRADA with Shell, DOE EERE VTO DE-FOA-0000239 (competitive solicitation), $1,200,000 (all to ORNL), 2012-15.
		32. J. Qu (PI), H.M. Luo, H.H. Elsentriecy, G.-L. Song, “Corrosion prevention of magnesium alloys via surface conversion treatments using ionic liquids,” ORNL LDRD Seed (competitive solicitation), $190,000, 2013-14.
		33. J. Qu (PI), P.J. Blau, S. Dai, H.M. Luo, B.G. Bunting, C. Kim, S.C. Tung (GM), E.W. Schneider (GM), “Ionic liquids as novel lubricants for engine applications,” CRADA with GM, DOE EERE VTO, $1,000,000 (all to ORNL), 2009-13.
		34. J. Qu (PI), “High performance anode for Li-Ion batteries,” Collaboration with Bren-Tronic Energy Systems, UT-Battelle’s PFTT Maturation Fund (competitive solicitation), $50,000, 2012-13.
		35. J. Qu (PI), J. Simpson (co-lead), V.K. Sikka, D. Speicher (Ross), A. Jones (Ross), C.H. Choi (RIT), “Nanostructured superhydrophobic coatings for breakthrough energy savings,” Collaboration with Ross Technologies, DOE EERE ITP FOA Nanomanufacturing Initiative (competitive solicitation), $1,995,000 (all to ORNL), 2009-12.
		36. J. Qu (PI), H.M. Luo, N.J. Dudney, D. Ma, “Vertically-aligned Cu-Si core-shell nanowire array as a high-performance anode material for energy storage,” ORNL LDRD Seed (competitive solicitation), $183,000, 2010-11.
		37. J. Qu (PI) and S. Dai, “Synthesis of highly ordered TiO2 nanotubes using ionic liquids for photovoltaics applications,” DOE EERE ITP FOA Nanomanufacturing Initiative (competitive solicitation), $200,000, 2010-11.
		38. B. Lisowsky (Eaton PI), D. Zhu (Eaton), B. Cook (Ames Lab), P.J. Blau, J. Qu, V.K. Sikka, C.K. Jun, J. Goldsmith (Greenleaf), “Nanocoatings for high-efficiency industrial hydraulic and tooling systems,” Collaboration with Eaton and Greenleaf, DOE EERE ITP FOA DE-PS36-05GO95011 (competitive solicitation), $2,000,000 ($600,000 to ORNL), 2007-10.
		39. J. Qu (PI), Z. Feng, P.J. Blau, X.L. Wang, L. An, J.J. Truhan, E. Lara-Curzio1, H. Wang, S.A. David, “A novel process of thick nanocomposite surfaces for defense applications,” ORNL LDRD Fund (competitive solicitation), $600,000, 2007-08.
		40. J. Qu (PI), P.J. Blau, W.H. Peter, J. Kiggans, “Low-cost, high-performance titanium brake rotors,” ORNL MSTD Maturation Fund, $20,000, 2008.
		41. G.M. Ludtka (PI), J. Qu (co-lead), “Improving enamel-based coatings,” SSW Holding, $50,000, 2006-07.
		42. J. Qu (PI), J.J. Truhan, S. Dai, H.M. Luo, P.J. Blau, “Ionic liquids as novel lubricants,” ORNL LDRD Seed (competitive solicitation), $145,000, 2005-06.
		43. P.J. Blau (PI), J. Qu (co-lead), J. Klett, “Investigation of tribological properties of graphitic foam reinforced carbon-carbon composites,” ORNL LDRD Seed (competitive solicitation), $20,000, 2003.

**PATENTS**

1. C. Kumara, J. Qu, “Metal nanoparticles as lubricant additives,” U.S. Patent #11,370,988, Jun. 28, 2022.
2. J. Qu, H.M. Luo, “Ionic liquids containing symmetric quaternary phosphonium cations and phosphorus-containing anions, and their use as lubricant additives,” U.S. Patent #10,435,642, Oct. 8, 2019. [*Licensed to Driven Racing Oil in 2019*]
3. J. Qu, H.M. Luo, “Corrosion prevention of magnesium surfaces via surface conversion treatments using ionic liquids,” U.S. Patent #9,435,033, Sept. 6, 2016.
4. Z. Feng, J. Qu, M.L. Santella, T.Y. Pan, A.D. Roche, Y.U. Sheng-Tao, “Method of making nanoparticle reinforced metal matrix components,” U.S. Patent #9,023,128, May 5, 2015.
5. C. Higdon, A.A. Elmoursi, J. Goldsmith, B. Cook, P.J. Blau, J. Qu, R. Milner, “Ion beam sputter target and method of manufacture,” U.S. Patent #8,821,701, Aug. 13, 2014.
6. J. Qu, H.T. Lin, P.J. Blau, V.K. Sikka, “Titanium aluminide intermetallic alloys with improved wear resistance,” U.S. Patent #8,771,439, July 8, 2014.
7. J.A. Ambrose, G. Mackiewicz-Ludtka, V.K. Sikka, J. Qu, “Oven rack having integral lubricious, dry porcelain surface,” US Patent #8,739,773, June 3, 2014.
8. J. Qu, S. Dai, and H.M. Luo, "Method for synthesis of titanium dioxide nanotubes using ionic liquids," U.S. Patent #8,585,886, Nov. 19, 2013.
9. J. Qu, J.J. Truhan, S. Dai, H.M. Luo, P.J. Blau, “Lubricants or lubricant additives composed of ionic liquids containing ammonium cations,” U.S. Patent #7,754,664, July 13, 2010.
	* *The first granted U.S. patent on the topic of ionic liquids lubrication*
10. J. Qu, C. Kumara, T. Li, “A High-Efficiency Seal Composed of Carbon Nanotubes,” U.S. Patent Application, 63/284,753, Dec. 1, 2021.
11. C. Kumara, J. Qu, P.A. Menchhofer, “Superlubricity coating containing carbon nanotubes,” U.S. Patent Application, 17/090,216, Nov. 5, 2020.
12. J. Qu, H.M. Luo, X. He, “Ionic liquids containing quaternary ammonium and phosphonium cations, and their use as environmentally friendly lubricant,” U.S. Patent Application 17/078,668, Oct. 23, 2020 and International Application PCT/US2021/043260, July 27, 2021.
13. J. Qu, W.C. Barnhill, H.M. Luo, B. Kheireddin, H. Gao, B.L. Papke, “Lubricant formulations containing phosphonium ionic liquids,” U.S. Patent Application 62/321,881, April 13, 2016.
14. J. Qu, H.M. Luo, “Ionic liquids containing protic or symmetric aprotic ammonium cations and phosphinate anions as lubricant additives,” U.S. Patent Application 62/321,877, April 13, 2016.
15. B. Zhao, A.E. Wright, K. Wang, J. Qu, “Oil-soluble polymer brush-grafted nanoparticles and uses thereof,” U.S. Patent Application 62/326,244, April 2, 2016.
16. J. Qu, H.M. Luo, Y. Zhou, J. Dyck, T. Graham, “Ionic liquids containing quaternary phosphonium cations and carboxylate anions, and their use as lubricant additives,” U.S. Patent Application 14/444,029, July 28, 2014.
17. J. Qu, T.M. Besmann, S. Dai, X. Zhang, “Multijunction hybrid solar cell incorporating vertically-aligned silicon nanowires with thin-films,” U.S. Patent Application 13/250,044, Sept. 30, 2011.
18. J. Qu, S. Dai, “Composite nanowire compositions and methods of synthesis,” U.S. Patent Application 12/904,559, Oct. 14, 2010.

**PUBLICATIONS**

*Standardized citation metric*: Top 100,000 of the most-cited scientists in 2019 across all fields; Top 1% of 2019 and top 2% of career life in the field of Mechanical Engineering & Transports

*Google Scholar citations*: 6600+, *h*-index: 44

<https://scholar.google.com/citations?user=kC_r23MAAAAJ&hl=en>

* + **Special Journal Issues Edited**
1. “Advanced Lubrication for Energy Efficiency II,” Ed. by J. Qu, W. Li, and C. Kumara, *Lubricants*, 2020-21.
2. “Ionic Liquids in Tribology,” Ed. by Y. Zhou, Harman Khare, and J. Qu, *Frontiers in Mechanical Engineering*, 2020-21.
3. “Advanced Tribology and Lubrication: From Nanoscale Phenomena to Real World Applications,” Ed. by J. Qu and A. Martini, *Frontiers in Mechanical Engineering*, 2018-19.
4. “Advanced Lubrication for Energy Efficiency,” Ed. by J. Qu and H. Ghaednia, *Lubricants*, 2018.
* **Book Chapters**
1. J. Qu, Chapter 23 “Diesel Fuel Lubrication and Testing,” in: S.C. Tung and G.E. Totten, eds. *Automotive Lubricants and Testing*, Eagan, MN, ASTM International, SAE International, 2012.
2. J. Qu, H.M. Meyer, “X-Ray Photoelectron Spectroscopy,” in: *Encyclopedia of Tribology*, Springer, 2013.
3. A.H. Heuer, J. Qu, L. O’Donnell, “Low Temperature Carburization,” in: *Encyclopedia of Tribology*, Springer, 2013.
* **ASTM International Standards**
1. ASTM G181, “Standard Test Method for Conducting Friction Tests of Piston Ring and Cylinder Liner Materials Under Lubricated Conditions,” *ASTM International*, 03.02 (2004).
2. ASTM G206, “Guide for Measuring the Wear Volumes of Piston Ring Segments Run Against Flat Coupons in Reciprocating Wear Tests,” *ASTM International*, 03.02 (2011).
* **Refereed Journal Papers** (*total 129, first or corresponding author\* of 85*)
1. S. Men\*, Y. Sun, P. Licence, J. Qu\*, “X-ray photoelectron spectroscopy of morpholinium ionic liquids: impact of the long alkyl side substituent on the cation-anion interactions,” *Physical Chemistry Chemical Physics* 24 (2022) 24845−24851.
2. S. Roy\*, N. Sridharan, A. Gangopadhyay, J. Qu\*, “A comparative tribo-mechanical behavior analysis of laser cladded Nitronic 60 coating against wrought Nitronic 60 alloy,” *Manufacturing Letters* 33 (2022) 586-592.
3. J. Keiser, X. He, D. Sulejmanovic, J. Qu, K.R. Robb, K. Oldinski, “Material selection and corrosion studies of candidate bearing materials for use in molten chloride salts,” *Journal of Solar Energy Engineering* 145 (2023) 021001.
4. V. Bedekar, K. Mistry, R. Voothaluru, J. Qu, J. Poplawsky, “Atomistic investigation of calcium sulfonate and lithium complex grease tribofilms under severe sliding conditions,” *CIRP Annals Manufacturing Technology* (2022) 71 (2022) 497-500.
5. L. Lin\*, D. Lanning, J.R. Keiser, J. Qu\*, “Investigation of cutter-woodchip contact pressure in a new biomass comminution system,” *Frontiers in Energy Research* 10 (2022) 754811.
6. C. Kumara, R. Wang, R.Y. Lu, C. Deck, J. Gazza, J. Qu\*, “Grid-to-rod fretting wear study of SiC/SiC composite accident-tolerant fuel claddings using an autoclave fretting bench test,” *Wear* 488–489 (2022) 204172.
7. K. Lee, D. Lanning, L. Lin, E. Cakmak, J.R. Keiser, J. Qu\*, “Wear mechanism analysis of a new rotary shear biomass comminution system,” *ACS Sustainable Chemistry & Engineering* 9 (2021) 11652−11660.
8. D. Kim, T.J. Toops, K. Nguyen, M.J. Lance, J. Qu, “Impact of primary and secondary ZDDP and ionic liquid as lubricant oil additives on the performance and physicochemical properties of Pd-based three-way catalysts,” *Catalysts* 11 (2021) 878.
9. S. Roy, N. Sridharan, E. Cakmak, H. Ghaednia, A. Gangopadhyay, J. Qu\*, “Post weld heat treatment and operating temperature effect on tribological behavior of laser cladded Stellite 21 coating,” *Wear* 482–483 (2021) 203990.
10. C. Kumara\*, L. Speed, M. Viola, H.M. Luo, J. Qu\*, “Using ionic liquid additive to enhance lubricating performance for low-viscosity engine oil,” *ACS Sustainable Chemistry & Engineering* 9 (2021) 7198–7205.
11. X. He, K.R. Robb, D. Sulejmanovic, J.R. Keiser, J. Qu\*, “Effects of particle size and concentration of magnesium oxide (MgO) on the lubricating performance of a chloride molten salt for concentrating solar power,” *ACS Sustainable Chemistry & Engineering* 9 (2021) 4941−4947.
12. X. He, R. Wang, D. Sulejmanovic, K.R. Robb, J.R. Keiser, K. Oldinski, J. Qu\*, “Tribological behavior of ceramic-alloy bearing contacts in molten salt lubrication for concentrating solar power,” *Solar Energy Materials and Solar Cells* 225 (2021) 111065.
13. X. He, H.M. Meyer, H.M. Luo, J. Qu\*, “Wear penalty for steel rubbing against hard coatings in reactive lubricants,” *Tribology International* 160 (2021) 107010.
14. S. Roy, B.C. Stump, H.M. Luo, D. Leonard, J. Qu\*, “Why does a phosphonium-phosphinate ionic liquid protect the contact surfaces from wear and micropitting but increase vibration when used as an additive in rolling-sliding lubrication?” *Tribology International* 159 (2021) 106949.
15. S. Roy, L. Speed, M. Viola, H.M. Luo, D. Leonard, J. Qu\*, “Oil miscible phosphonium-phosphate ionic liquid as novel antiwear and antipitting additive for low-viscosity rear axle lubricants,” *Wear* 466–467 (2021) 203588.
16. B. Reed, R. Wang, R.Y. Lu, J. Qu\*, “Autoclave grid-to-rod fretting wear evaluation of a candidate cladding coating for accident-tolerant fuel,” *Wear* 466–467 (2021) 203578.
17. K. Li, X. Zhao, D. Mcgrady, D. Ker, H. Tekinalp, X. He, J. Qu, E. Cakmak, J. Phipps, S. Ireland, V. Kunc, S. Ozcan, “Surface-modified and oven-dried microfibrillated cellulose reinforced biocomposites: Cellulose network enabled high performance,” *Carbohydrate Polymers* 256 (2021) 117525.
18. D. Ngo, X. He, H.M. Luo, J. Qu, S.H. Kim, “Competitive adsorption of ionic liquids versus friction modifier and antiwear additive at solid/lubricant interface - speciation with vibrational sum frequency generation spectroscopy,” *Lubricants* 8 (2020) 98.
19. D. Ngo, X. He, H.M. Luo, J. Qu, S.H. Kim, “Competitive adsorption of lubricant base oil and ionic liquid additives at air/liquid and solid/liquid interfaces,” *Langmuir* 36 (2020) 7582−7592.
20. L.A. Boatner, B.C. Chakoumakos, P.S. Phani, S.N. Dryepondt, A. Shaw, J. Qu, A.E. Márquez Rossy, E. Lara-Curzio, M. McGuire, J.A. Kolopus, “Cryo-quenched Fe-Ni-Cr alloy decorative steel single crystals II: alloy phases, structure, hardness, tensile, tribological, magnetic and electronic properties,” *Journal of Alloys and Compounds* 835 (2020) 155169.
21. W. Li, C. Kumara, H.M. Luo, H.M. Meyer, X. He, D. Ngo, S. Kim, J. Qu\*, “Ultra-low boundary lubrication friction by three-way synergistic interactions among ionic liquid, friction modifier, and dispersant,” *ACS Applied Materials & Interfaces* 12 (2020) 17077−17090.
22. S. Roy, K. Lee, J.A. Lacey, V.S. Thompson, J.R. Keiser, J. Qu\*, “Material characterization-based wear mechanism investigation for biomass hammer mills,” *ACS Sustainable Chemistry & Engineering* 8 (2020) 3541−3546.
23. O. Oyedeji, P. Gitman, J. Qu, E. Webb, “Understanding the impact of lignocellulosic biomass variability on size reduction process: a review,” *ACS Sustainable Chemistry & Engineering* 8 (2020) 2327-2343.
24. C. Kumara, H.M. Meyer, J. Qu\*, “Material dependent antagonistic effects between soot and ZDDP,” *Advanced Materials Interfaces* (2020) 1901956.
25. K. Lee, S. Roy, E. Cakmak, J.A. Lacey, T.R. Watkins, H.M. Meyer, V.S. Thompson, J.R. Keiser, J. Qu\*, “Composition-preserving extraction and characterization of biomass extrinsic and intrinsic inorganic compounds,” *ACS Sustainable Chemistry & Engineering* 8 (2020) 1599−1610.
26. D. Kim, T.J. Toops, K. Nguyen, D.W. Brookshear, M.J. Lance, J. Qu, “Impact of lubricant oil additives on the performance of Pd-based three-way catalysts,” *Emissions Control Science and Technology* (2019) doi: 10.1007/s40825-019-00138-x.
27. B.C. Stump, Y. Zhou, H.M. Luo, D.N. Leonard, M.B. Viola, J. Qu\*, “A new functionality of ionic liquids as lubricant additives: mitigating rolling contact fatigue,” *ACS Applied Materials & Interfaces* 11 (2019) 30484−30492.
28. C. Kumara, H.M. Meyer, J. Qu\*, “Synergistic interactions between silver and palladium nanoparticles in lubrication,” *ACS* *Applied Nano Materials* 2 (2019) 5302−5309.
29. Y. Zhou\*, J. Weber, M.B. Viola, J. Qu\*, “Is more always better? Tribofilm evolution and tribological behavior impacted by the concentration of ZDDP, ionic liquid, and ZDDP-ionic liquid combination,” *Wear* 432−433 (2019) 202951.
30. H. Duan, W. Li, C. Kumara, Y. Jin, H. Meyer, H.M. Luo, J. Qu\*, “Ionic liquids as oil additives for lubricating oxygen-diffusion case-hardened titanium,” *Tribology International* 136 (2019) 342–348.
31. W. Guo, Z. Pei, X. Sang, H. Bei, S. Bruschi, J. Qu, J.D. Poplawsky, D. Raabe, “Shape-preserving machining produces gradient nanolaminate medium entropy alloys with high energy absorption capability,” *Acta Materialia* 170 (2019) 176–186.
32. C. Kumara, D.N. Leonard, H.M. Meyer, H.M. Luo, B.L. Armstrong, J. Qu\*, “Palladium nanoparticles enabled ultra-thick tribofilm with unique composition,” *ACS Applied Materials & Interfaces* 10 (2018) 31804−31812.
33. W. Li, C. Kumara, H.M. Meyer, H.M. Luo, J. Qu\*, “Compatibility between various ionic liquids and an organic friction modifier as lubricant additives,” *Langmuir* 34 (2018) 10711–10720.
34. Y. Zhou\*, W. Li, B.C. Stump, R.M. Connatser, S. Lazarevic, J. Qu\*, “Impact of fuel contents on tribological performance of PAO base oil and ZDDP,” *Lubricants* 6 (2018) 79.
35. S. Lazarevic, R. Y. Lu, C. Favede, G. Plint, P. J. Blau, J. Qu\*, “Investigating grid-to-rod fretting wear of nuclear fuel claddings using a unique autoclave fretting rig,” *Wear* 412–413 (2018) 30–37.
36. B. Seymour, W. Fu, R. Wright, J. Qu\*, S. Dai, B. Zhao\*, “Improved lubricating performance by combining oil-soluble hairy silica nanoparticles and an ionic liquid as an additive for a synthetic base oil,” *ACS Applied Materials & Interfaces* 10 (2018) 15129–15139.
37. B.C. Stump, Y. Zhou, M.B. Viola, H. Xu, R.J. Parten, J. Qu\*, “A rolling-sliding bench test for investigating rear axle lubrication,” *Tribology International* 121 (2018) 450-459.
38. C. Kumara, H.M. Luo, D.N. Leonard, H.M. Meyer, J. Qu\*, “Organic-modified silver nanoparticles as lubricant additives,” *ACS Applied Materials & Interfaces* 9 (2017) 37227–37237.
39. Y. Zhou\*, D.N. Leonard, W. Guo, J. Qu\*, “Understanding tribofilm formation mechanisms in ionic liquid lubrication,” *Scientific Reports* 7 (2017) 8426.
40. B. Seymour, R. Wright, A. Parrott, H. Gao, A. Martini, J. Qu\*, S. Dai, B. Zhao\*, “Poly(alkyl methacrylate) brush-grafted silica nanoparticles as oil lubricant additives: effects of alkyl pendant group on oil dispersibility, stability, and lubrication property,” *ACS Applied Materials & Interfaces* 9 (2017) 25038−25048.
41. W. Guo\*, Y. Zhou, X. Sang, D.N. Leonard, J. Qu\*, J.D. Poplawsky, “Atom probe tomography unveils growth mechanisms of wear-protective tribofilms formed by ZDDP, ionic liquid, and their combination,” *ACS Applied Materials & Interfaces* 9 (2017) 23152–23163.
42. Y. Zhou, J. Qu\*, “Ionic liquids as lubricant additives – a review,” *ACS Applied Materials & Interfaces* 9 (2017) 3209-3222.
	* ***Citations in the top 1% of the academic field of Chemistry in 2018-19***
43. A.H. Shaw, J. Qu\*, C. Wang, R.D. England, "Tribological study of diesel piston skirt coatings in CJ-4 and PC-11 engine oils,” *Wear* 376-377 (2017) 1673–1681.
44. J.W. McMurray, Y. Zhou, H.M. Luo, J. Qu, “Vaporization behavior of tetraoctylphosphonium bis(2-ethylhexyl)phosphate ionic liquid,” *Chemical Physics Letters* 667 (2017) 55-61.
45. J.W. Robinson, Y. Zhou, J. Qu, J.T. Bays, L. Cosimbescu, “Highly branched polyethylenes as lubricant viscosity and friction modifiers,” *Reactive and Functional Polymers* 109 (2016) 52-55.
46. P. J. Blau, J. Qu, R. Lu, “Modeling of complex wear behavior associated with grid-to-rod fretting in light water nuclear reactors,” *JOM* 68 (2016) 2938-2943.
47. L. Cosimbescu, J.W. Robinson, Y. Zhou, J. Qu, “Dual Functional Star Polymers for Lubricants,” *RSC Advances* 6 (2016) 86259-86268.
48. W.C. Barnhill, H.M. Luo, H.M. Meyer, C. Ma, M. Chi, B.L. Papke, J. Qu\*, “Tertiary and quaternary ammonium-phosphate ionic liquids as lubricant additives,” *Tribology Letters* 63 (2016) 22.
49. H. Jiang, J. Qu, R.Y. Lu, J.J. Wang, “Grid-to-rod flow-induced impact study for PWR fuel in reactor,” *Progress in Nuclear Energy* 91 (2016) 355–361.
50. K. Jin, C. Lu, L.M. Wang, J. Qu, W.J. Weber, Y. Zhang, H. Bei, “Controlling chemical complexity: path toward swelling-resistant alloys,” *Scripta Materialia* 119 (2016) 65–70.
51. R.A.E. Wright, K. Wang, J. Qu\*, B. Zhao\*, “Oil-soluble polymer brush-grafted nanoparticles as effective lubricant additives for friction and wear reduction,” ***Angewandte Chemie International Edition*** 55 (2016) 8656–8660.
52. J. Qu\*, P.J. Blau, C. Higdon, B.A. Cook, “Friction behavior of a multi-interface system and improved performance by AlMgB14-TiB2-C and diamond-like-carbon coatings,” *Tribology International* 99 (2016) 182-186.
53. J.W. Robinson, Y. Zhou, R. Erck, J. Qu, J.T. Bays, L. Cosimbescu, “Effects of star-shape poly(alkyl methacrylate) arm uniformity on lubricant properties,” *Journal of Applied Polymer Science* 133 (2016) 43611.
54. J. Qu\*, K.M. Cooley, A.H. Shaw, R.Y. Lu, P.J. Blau, “Assessment of wear coefficients of nuclear zirconium claddings without and with pre-oxidation,” *Wear* 356-357 (2016) 17-22.
55. A.K. Landauer, W.C. Barnhill, J. Qu\*, “Correlating mechanical properties and anti-wear performance of tribofilms formed by ionic liquids, ZDDP and their combinations,” *Wear* 354-355 (2016) 78-82.
56. C. Xie, T. Toops, M. Lance, J. Qu, M. Viola, S. Lewis, D. Leonard, E. Hagaman, “Impact of lubricant additives on the physicochemical properties and activity of three way catalysts,” *Catalysts* 6 (2016) 54.
57. J. Robinson, Y. Zhou, P. Bhattacharya, R. Erck, J. Qu, J. Bays, L. Cosimbescu, “Probing the molecular design of hyper-branched aryl polyesters towards lubricant applications,” *Scientific Reports* 6 (2016) 18624.
58. W.C. Barnhill, H. Gao, B. Kheireddin, B.L. Papke, H.M. Luo, B.H. West, J. Qu\*, “Tribological bench and engine dynamometer tests of a low viscosity SAE 0W-16 engine oil using a combination of ionic liquid and ZDDP as anti-wear additives,” *Frontiers in Mechanical Engineering* 1 (2015) 12.
59. Y. Zhou, D.N. Leonard, H.M. Meyer, H.M. Luo, J. Qu\*, “Does the use of diamond-like carbon coating and organophosphate lubricant additive together causes excessive tribochemical material removal?” *Advanced Materials Interfaces* (2015) 1500213.
60. J. Qu\*, W.C. Barnhill, H.M. Luo, H.M. Meyer, D.N. Leonard, A.K. Landauer, B. Kheireddin, H. Gao, B.L. Papke, S. Dai, “Synergistic effects between phosphonium-alkylphosphate ionic liquids and ZDDP as lubricant additives,” ***Advanced Materials*** 27 (2015) 4767-4774.
61. W.F. Rohr, K. Nguyen, B.G. Bunting, J. Qu, “Feasibility of Observing Small Differences in Friction Mean Effective Pressure Between Different Lubricating Oil Formations using Small, Single-Cylinder Motored Engine Rig,” *Tribology Transactions* 58 (2015) 1067–1075.
62. J. Qu\*, H.M. Meyer III, Z.-B. Cai, C. Ma, H.M. Luo, “Characterization of ZDDP and ionic liquid tribofilms on non-metallic coatings providing insights of tribofilm formation mechanisms,” *Wear* 332-333 (2015) 1273–1285.
63. Z.-B. Cai, Y. Zhou, J. Qu\*, “Effect of oil temperature on tribological behavior of a lubricated steel−steel contact,” *Wear* 332-333 (2015) 1158–1163.
64. W.C. Barnhill, J. Qu\*, H.M. Luo, H.M. Meyer III, C. Ma, M. Chi, B.L. Papke, “Phosphonium-organophosphate ionic liquids as lubricant additives: effects of cation structure on physicochemical and tribological characteristics,” *ACS Applied Materials & Interfaces* 6 (2014) 22585–22593.
65. Y. Zhou, J. Dyck, T. Graham, H.M. Luo, D.N. Leonard, J. Qu\*, “Ionic liquids composed of phosphonium cations and organophosphate, carboxylate, and sulfonate as lubricant antiwear additives,” *Langmuir* 30 (2014) 13301–13311.
66. Z.-B. Cai, H.M. Meyer III, C. Ma, M. Chi, H.M. Luo, J. Qu\*, “Comparison of the tribological behavior of steel-steel and Si3N4-steel contacts in lubricants with ZDDP or ionic liquid,” *Wear* 319 (2014) 172–183.
67. H.H. Elsentriecy, J. Qu\*, H.M. Luo, H.M. Meyer III, C. Ma, M. Chi, “Improving corrosion resistance of AZ31B magnesium alloy via a conversion coating produced by a protic ammonium-phosphate ionic liquid,” *Thin Solid Films* 568 (2014) 44–51.
68. H.H. Elsentriecy, H.M. Luo, H.M. Meyer III, L.L. Grado, J. Qu\*, “Effects of pretreatment and process temperature of a conversion coating produced by an aprotic ammonium-phosphate ionic liquid on magnesium corrosion protection,” *Electrochimica Acta* 123 (2014) 58–65.
69. J. Qu\*, H.M. Luo, M. Chi, C. Ma, P.J. Blau, S. Dai, M.B. Viola, “Comparison of an oil-miscible ionic liquid and ZDDP as a lubricant anti-wear additive,” *Tribology International* 71 (2014) 88–97.

***– Among Top-cited 8 papers published by Tribology International in 2014***

1. W.D. Li, H. Bei, J. Qu, Y.F. Gao, “Effects of machine stiffness on the loading-displacement curve during spherical nano-indentation,” *Journal of Materials Research* 28(14) (2013) 1903–1911.
2. G. Mordukhovich, J. Qu\*, J.Y. Howe, S.S. Bair, B. Yu, H.M. Luo, D.J. Smolenski, P.J. Blau, B.G. Bunting, S. Dai, “A low-viscosity ionic liquid demonstrating superior lubricating performance from mixed to boundary lubrication,” *Wear* 301 (2013) 740–746.
3. H. Li, S.K. Martha, R.R. Unocic, H.M. Luo, S. Dai, J. Qu\*, “High cyclability of ionic liquid–produced TiO2 nanotube arrays as an anode material for lithium-ion batteries,” *Journal of Power Sources* 218 (2012) 88–92.
4. J. Qu\*, D.G. Bansal, B. Yu, J. Howe, H.M. Luo, S. Dai, H. Li, P.J. Blau, B.G. Bunting, G. Mordukhovich, D.J. Smolenski, “Anti-wear performance and mechanism of an oil-miscible ionic liquid as a lubricant additive,” *ACS Applied Materials & Interfaces* *4* (2012) 997–1002.
5. B. Yu, D.G. Bansal, J. Qu\*, X. Sun, H.M. Luo, S. Dai, P.J. Blau, B.G. Bunting, G. Mordukhovich, D.J. Smolenski, “Oil-miscible and non-corrosive phosphonium-based ionic liquids as candidate lubricant additives,” *Wear* 289 (2012) 58–64.

***– 3rd most cited among papers published by WEAR in 2012***

1. J. Qu\*, H. Li, J.J. Henry Jr., S.K. Martha, N.J. Dudney, H. Xu, M. Chi, M.J. Lance, S.M. Mahurin, T.M. Besmann, S. Dai, “Self-aligned Cu-Si core-shell nanowire array as a high-performance anode for Li-ion batteries,” *Journal of Power Sources* 198 (2012) 312–317.
2. L. An, J. Qu, J. Luo, Y. Fan, L. Zhang, J. Liu, C. Xu, P.J. Blau, “Aluminum nanocomposites having wear resistance better than stainless steel,” *Journal of Materials Research,* 26 (2011) 2479–2483.
3. C. Higdon, B. Cook, J. Harringa, A. Russell, J. Goldsmith, J. Qu, and P.J. Blau, “Friction and wear mechanisms in AlMgB14-TiB2 nanocoatings,” *Wear* 271 (2011) 2111–2115.
4. J. Qu\*, H. Xu, Z. Feng, D.A. Frederick, L. An, H. Heinrich, “Improving the tribological characteristics of aluminum 6061 alloy by surface compositing with sub-micro-size ceramic particles via friction stir processing,” *Wear* 271 (2011) 1940–1945.
5. J. Qu\*, H.M. Meyer III, P.J. Blau, B.G. Bunting, “Low-temperature colossal carbon supersaturation enables anti-wear boundary film formation for austenitic stainless steels in oil-lubricated environment,” *Wear* 271 (2011) 1733–1738.
6. H. Li, J. Qu\*, Q. Cui, H. Xu, H.M. Luo, M. Chi, R.A. Meisner, W. Wang, S. Dai, “TiO2 nanotube arrays grown in ionic liquids: high-efficiencies in photocatalysis and pore-widening,” *Journal of Materials Chemistry* 21 (2011) 9487–9490.
7. J. Qu\*, M. Chi, H.M. Meyer III, P.J. Blau, S. Dai, H.M. Luo, “Nanostructure and composition of tribo-boundary films formed in ionic liquid lubrication,” *Tribology Letters* 43 (2011) 205-211.
8. A.M. Kovalchenko, P.J. Blau, J. Qu, and S. Danyluk, “Scuffing initiation in metals sliding against copper under non-lubricated conditions,” *Wear*, 271 (2011) 2998–3006.
9. B.A. Cook, J.L. Harringa, J. Anderegg, A.M. Russell, J. Qu, P. J. Blau, C. Higdon, A.A. Elmoursi, “Analysis of wear mechanisms in low friction, nanocomposite AlMgB14-TiB2 coatings,” *Surface and Coatings Technology* 205 (2010) 2296-2301.
10. W. Li, P.J. Blau, J. Qu, S.J. Park, R.M. German, “Tribological behavior of die tool materials used for die compaction in powder metallurgy,” *Powder Metallurgy* 53 (2010) 251-259.
11. F. Jiang, J. Qu, G. Fan, W. Jiang, D. Qiao, M.W. Freels, P.K. Liaw, H. Choo “Tribological studies of a Zr-based glass-forming alloy with different states,” *Advanced Engineering Materials* 11 (2009) 925-931.
12. J. Qu\*, P.J. Blau, S. Dai, H.M. Luo, H.M. Meyer III, “Ionic liquids as novel lubricants and additives for diesel engine applications,” *Tribology Letters* 35 (2009) 181-189.
13. M. Beltowksi. P.J. Blau, J. Qu, “Wear of spheroidal graphite cast irons for tractor drive train components,” *Wear* 267 (2009) 1752-1756.
14. H. Xu, C.R. Hubbard, K. An, Z. Feng, X.-L. Wang, J. Qu\*, “Neutron diffraction measurement of residual stresses in friction stir processed nanocomposite surface layer,” *Advanced Engineering Materials* 11 (2009) 650-653.
15. J. Qu\*, P.J. Blau, S. Dai, H.M. Luo, H.M. Meyer III, J.J. Truhan, “Tribological characteristics of aluminum alloys against steel lubricated by imidazolium and ammonium ionic liquids,” *Wear* 267 (2009) 1226-1231.
16. J. Qu\*, P.J. Blau, B.C. Jolly, “Oxygen-diffused titanium as a candidate brake rotor material,” *Wear* 267 (2009) 818-822.
17. P.J. Blau, M. Yao, J. Qu, J. Wu, “Use of multiple criteria to map the high-temperature scuffing behavior of Co-based superalloys,” *Wear* 267 (2009) 374-379.
18. J. Qu\*, H. Xu, Z. Feng, K. An, R. Battiste, L. An, H. Heinrich, “Forming Al-Al2O3 nanocomposite surfaces using friction stir processing,” *Transactions of NAMRI/SME* 37 (2009) 349-356.
19. J. Qu\*, P.J. Blau, J.Y. Howe, H.M. Meyer III, “Oxygen diffusion enables anti-wear boundary film formation on titanium surfaces in zinc-dialkyl-dithiophosphate (ZDDP)-containing lubricants,” *Scripta Materialia* 60 (2009) 886-889.
20. J. Qu\*, P.J. Blau, L. Zhang, H. Xu, “Effects of multiple treatments of low-temperature colossal supersaturation on tribological characteristics of austenitic stainless steels,” *Wear* 265 (2008) 1909-1913.
21. J. Qu\*, P.J. Blau, “A new model to calculate friction coefficients and shear stresses in thermal drilling,” *ASME Journal of Manufacturing Science and Engineering* 130 (2008) 014502.
22. C.C. Klepper, J.M. Williams, J.J. Truhan, J. Qu, L. Riester, R.C. Hazelton, J.J. Moschella, P.J. Blau, J.P. Anderson, O.O. Popoola, M.D. Keitz, “Tribo-mechanical properties of thin boron coatings deposited on polished cobalt alloy surfaces for orthopedic applications,” *Thin Solid Films* 516 (2008) 3070-3080.
23. T.W. Liao, F.M. Tang, J. Qu, P.J. Blau, “Grinding wheel condition monitoring with boosted minimum distance classifiers,” *Mechanical Systems and Signal Processing* 22 (2008) 217-232.
24. J. Qu\*, P.J. Blau, V.K. Sikka, “Measurement of the resistance of treated metal foils to scrubbing abrasion using a modified reciprocating wear test,” *Journal of ASTM International* 4 (2007) Paper ID JAI101294.
25. J. Qu\*, P.J. Blau, B.C. Jolly, “Tribological properties of stainless steels treated by colossal carbon supersaturation,” *Wear* 263 (2007) 719-726.
26. P.J. Blau, B.C. Jolly, J. Qu, W.H. Peter, C.A. Blue, “Tribological investigation of titanium-based materials for brakes,” *Wear* 263 (2007) 1202-1211.
27. J.J. Truhan, R. Menon F. LeClaire, J. Wallin, J. Qu, P.J. Blau, “The friction and wear of various hard-face claddings for deep-hole drilling,” *Wear* 263 (2007) 234-239.
28. T.W. Liao, C.F. Ting, J. Qu, P.J. Blau, “A wavelet-based methodology for grinding wheel condition monitoring,” *International Journal of Machine Tools & Manufacture* 47 (2007) 580-592.
29. J. Qu\*, J.J. Truhan, P.J. Blau, R. Ott, “The development of a pin-on-twin scuffing test to evaluate materials for heavy duty diesel fuel injectors,” *Tribology Transactions* 50 (2007) 50-57.
30. T.W. Liao, G. Hua, J. Qu, P.J. Blau, “Grinding wheel condition monitoring with hidden markov model-based clustering methods,” *Machining Science and Technology* 10 (2006) 511-538.
31. J. Qu\*, J.J. Truhan, “An efficient method for accurately determining wear volumes of sliders with non-flat wear scars and compound curvatures,” *Wear* 261 (2006) 848-855.
32. J. Qu\*, J.J. Truhan, S. Dai, H.M. Luo, P.J. Blau, “Ionic liquids with ammonium cations as lubricants or additives,” *Tribology Letters* 22 (2006) 207-214.

***– All-time top 10 most cited in Tribology Letters***

1. S.F. Miller, C.C. Kao, A.J. Shih, J. Qu, “Investigation of wire electrical discharge machining of thin cross-sections and compliant mechanisms,” *International Journal of Machine Tools & Manufacture* 45 (2005) 1641-1740.
2. J. Qu\*, A.J. Shih, R. Scattergood, J. Luo, “Abrasive micro-blasting to improve surface integrity of electrical discharge machined WC-Co composite,” *Journal of Materials Processing Technology* 166 (2005) 440-448.
3. J. Qu\*, J.J. Truhan, P.J. Blau, H.M. Meyer III, “Scuffing transition diagrams for heavy duty diesel fuel injector materials in ultra low-sulfur fuel-lubricated environment,” *Wear* 259 (2005) 1031-1040.
4. J.J. Truhan, J. Qu, P.J. Blau, “The effect of lubricating oil condition on the friction and wear of piston ring and cylinder liner materials in a reciprocating bench test,” *Wear* 259 (2005) 1048-1055.
5. J. Qu\*, P.J. Blau, T.R. Watkins, O.B. Cavin, N.S. Kulkarni, “Friction and wear of titanium alloys sliding against metal, polymer, and ceramic counterfaces,” *Wear* 258 (2005) 1348-1356.
6. J. Qu\*, J.J. Truhan, P.J. Blau, “Evaluating candidate materials for heavy duty diesel fuel injectors using a ‘pin-on-twin’ scuffing test,” *Tribology International* 38 (2005) 381-390.
7. J. Qu\*, J.J. Truhan, P.J. Blau, “Detecting the onset of localized scuffing with the pin-on-twin fuel-lubricated test for heavy duty diesel fuel injectors,” *International Journal of Engine Research* 6 (2005) 1-9.
8. J.J. Truhan, J. Qu, P.J. Blau, “A rig test to measure friction and wear of heavy duty diesel engine piston rings and cylinder liners using realistic lubricants,” *Tribology International* 38 (2005) 211-218.
9. J. Qu\*, J.J. Truhan, P.J. Blau, “Application of the ASTM loop abrasion test to cylindrical specimens,” *Journal of Testing and Evaluation*, JTE12508 33 (2005) 527-531.
10. J. Qu\*, P.J. Blau, J. Klett, B. Jolly, “Sliding friction and wear characteristics of novel graphitic foam materials,” *Tribology Letters* 17 (2004) 879-886.
11. C.W. Hardin, J. Qu, A.J. Shih, “Fixed abrasive diamond wire saw slicing of single crystal silicon carbide wafers,” *Materials and Manufacturing Processes* 19 (2004) 355–367.
12. J. Qu\*, R. Sarma, “The continuous non-linear approximation of procedurally defined curves using integral B-splines,” *Engineering with Computers* 20 (2004) 22-30*.*
13. S.F. Miller, A.J. Shih, J. Qu, “Investigation of the spark cycle on material removal rate in wire electrical discharge machining of advanced materials,” *International Journal of Machine Tools & Manufacture* 44 (2004) 391-400.
14. J. Patten, R. Fesperman, S. Kumar, S. McSpadden, J. Qu, M. Lance, R. Nemanich, J. Huening, “High-pressure phase transformation of silicon nitride,” *Applied Physics Letters* 83 (2003) 4740-4742.
15. J. Qu\*, A.J. Shih, “Analytical surface roughness parameters of a theoretical profile consisting of elliptical arcs,” *Machining Science and Technology* 7 (2003) 281-294*.*
16. J. Qu, L. Riester, A.J. Shih, R. Scattergood, E. Lara-Curzio, T. Watkins, “Nanoindentation characterization of surface layers of electrical discharge machined WC-Co,” *Materials Science and Engineering-A* 334 (2003) 125-131*.*
17. J. Qu, A.J. Shih, R. Scattergood, “Development of the cylindrical wire electrical discharge machining process, part II: surface integrity and roundness,” *ASME Journal of Manufacturing Science and Engineering* 124 (2002) 708-714.
18. J. Qu, A.J. Shih, R. Scattergood, “Development of the cylindrical wire electrical discharge machining process, part I: concept, design, and material removal rate,” *ASME Journal of Manufacturing Science and Engineering* 124 (2002) 702-707.
19. J. Qu, R. Sarma, “Least square curve and surface localization for shape conformance checking,” *SME Journal of Manufacturing Systems* 19 (2000) 297-304.

***– Outstanding Paper Award Finalist of NAMRI 1999*** *(Transactions of NAMRI/SME 27 (1999) 275-280)*

1. J. Qu\*, G.X. Zhang, “Environmental error compensation of displacement interferometry system,” *Chinese Aviation Engine* 104 (2001) 43-44, 3.
2. D.G. Li, G.X. Zhang, J. Qu, “Comprehensive compensation for the environmental error factor in high-accuracy laser interferometry,” *Chinese Opto-Electronic Engineering* 26 (1999) 28-33.
3. C.S. Dong, J. Qu, J.X. Wang, G.X. Zhang, Y.H. Mu, “Description of motion accuracy in coordinate measuring machines,” *Chinese Aviation Precision Manufacturing Technology* 34 (1998) 32-34.
4. B.H. Zhuang, W.W. Zhang, S.G. Feng, J. Qu, D. Cui, “Inner and exterior surface measurement using laser triangulation,” *Chinese Measuring Techniques* 8 (1995) 44-47.
* **Conference Proceedings** (>20, *available upon request*)
* **Invited Talks** (22)
1. “High-Efficiency Low-Toxicity Ionic Liquids as Lubricant Additives,” Invited seminar at *Quaker Houghton* (virtual), Feb. 8, 2022.
2. “Development of eco-friendly ionic liquids as novel lubricant additives,” *ACS Spring 2021*, Apr. 5–16, Virtual.
3. “Ionic liquids as energy-efficient lubricant additives for engines and gears,” *SAE E34 Propulsion Lubricants Committee Meeting*, March 23–26, 2020, Savannah, GA. [*cancelled due to COVID-19*]
4. “Ionic Liquids as Lubricant Additives and Their Compatibility with Coatings,” Invited seminar at *Ingersoll Rand*, May 25, 2018.
5. “Ionic Liquids as Next-Generation Lubricant Additives and Their Compatibility with Advanced Coatings,” Invited seminar at *University of Nevada at Reno*, Mar. 31, 2017.
6. “Antagonism between advanced coatings and lubricants?” *8th International Conference on Physical and Numerical Simulation of Materials Processing (ICPNS)*, Seattle, WA, Oct. 14–17, 2016.
7. “Ionic liquids as novel lubricant additives and their compatibility with other lubricant additives and non-ferrous materials,” *2016 Tribology Gordon Research Conference*, Lewiston, ME, Jun. 26 – Jul. 1, 2016
8. “Ionic Liquids as Novel Lubricant Additives,” Invited seminar at *Rochester Institute of Technology*, Mar. 31, 2016.
9. “Oil-Miscible Ionic Liquids as Multi-Functional Lubricant Additives,” Invited seminar at *ExxonMobil Research and Engineering Company*, Mar. 23, 2016.
10. “Oil-miscible ionic liquids as multi-functional additives for low-viscosity engine lubricants,” *20th International Colloquium Tribology*, Stuttgart, Germany, Jan. 12-14, 2016.
11. “Using ionic liquids as anti-wear additives to lubricate non-metallic surfaces,” *20th International Colloquium Tribology*, Stuttgart, Germany, Jan. 12-14, 2016.
12. “Low-viscosity lubricants using ionic liquids as base stocks or additives,” Symposium on Molecular Chemistry and Lubricant Rheology, *The STLE 70th Annual Meeting*, Dallas, TX, May 17-21, 2015.
13. “Oil-miscible ionic liquids as lubricant additives” in Panel Discussion: Ionic Liquids for Lubrication, *The STLE 69th Annual Meeting*, Orlando, FL, May 18-22, 2014.
14. “Ionic Liquids as Next Generation Anti-wear Additives: Molecular Design to Engine Dynamometer Testing,” *38th Automotive/Petroleum Industry Forum (Detroit Advisory Panel)*, Dearborn, MI, April 16, 2014.
15. “Ionic Liquid-Additized Engine Oil for Improved Fuel Efficiency,” *SAE 2014 High Efficiency IC Engine Symposium*, Detroit, MI, April 6-7, 2014.
16. “Ionic liquids as novel lubricants or lubricant additives,” *SAE 2012 High Efficiency IC Engines Symposium*,Detroit, MI, Apr. 22-23, 2012.
17. “Investigation of wear and surface damage on wind turbine bearing components” in Panel Discussion: U.S. DOE National Laboratory Research into Improvements in Reliability and Performance of Wind Turbine Drivetrains, *The 67th STLE Annual Meeting*, St. Louis, MO, May 6-10, 2012.
18. “Advanced surface treatments and coatings for improving tribological properties,” Keynote Talk in the Symposium for Hardfacing Coatings for Wear and Corrosion Resistance Applications, *Materials Science & Technology 2010 Conference and Exhibition*, Houston, TX, Oct. 17-21, 2010.
19. “Oxygen diffusion dramatically improves wear-resistance for titanium alloys,” *Global Powertrain Congress - North America*, Chicago, IL, Oct. 14-15, 2008.
20. “Tribological properties of stainless steels treated by colossal carbon supersaturation,” Keynote Talk in the Session of Surface Modifications and Coatings, *16th International Conference on Wear of Materials*, Montreal, Quebec, Canada, Apr. 15-19, 2007.
21. “Advanced low-friction high-wear-resistant lightweight materials,” *Institute for Defense and Government Advancement (IDGA)’s 4th: Next Generation Materials for Defense Conference*, Arlington, VA, Feb. 28 - Mar. 1, 2006.
22. “An efficient method for determining wear volumes of sliders with non-flat wear scars” in Panel Discussion: Instrumentation and Techniques for Wear Measurement, *The STLE 61st Annual Meeting*, Calgary, Alberta, Canada, May 7-11, 2006.