Lessa Kay Grunenfelder

Associate Professor of Engineering Practice
Mork Family Dept. of Chemical Engineering & Materials Science
Viterbi School of Engineering
University of Southern California

925 Bloom Walk, HED-213
Los Angeles, CA 90089-1211
213-740-2072
grunenfe@usc.edu

Education

PhD, Materials Science — December, 2012
University of Southern California, Los Angeles, CA
Dissertation: Defect control in vacuum bag only processing of composite prepregs

Diploma in Innovation — December, 2011
University of Southern California, Los Angeles, CA

MS, Materials Science — August, 2009
University of Southern California, Los Angeles, CA

BS, Astronautical Engineering — May, 2007
University of Southern California, Los Angeles, CA

Teaching Experience

Faculty, University of Southern California — August 2015-Present
Full time teaching faculty

Instructor, Essentials of Composite Manufacturing — December 2017-Present
USC Executive Education Program

Summer Faculty, Crossroads School for Arts and Sciences — Summer 2015-Summer 2017
Elementary school science teacher: Design It! Build It! Test It!

Work Experience

Part-time Staff Consultant, Engineering Systems Inc (ESi) — February 2023-Present
Failure analysis, technical review, research

Courses Taught

MASC 310: Materials Behavior and Processing

CHE 405: Applications of Probability and Statistic for Chemical Engineers

MASC 110L: Materials Science

AME 231L: Mechanical Behavior of Materials

ENGR 102: Engineering Freshman Academy

MASC 551: Mechanical Behavior of Engineering Materials

MASC 583: Materials Selection

MASC 310L: Materials Behavior and Processing

Course Development

Essentials of Composite Manufacturing (2017)
Co-developed lecture and laboratory content for an executive education program targeted at engineers working in the aerospace industry.

MASC 310 (Fall 2017)
Added hands-on labs and activities to a previously lecture-based course. Revised curriculum to better facilitate student engagement and learning.

MASC 310 and MASC 551 (Fall 2019)
Converted courses from 3-units to 4-units. New content added to both courses, software-based investigations added to the MASC 310 course

MASC 310L (Fall 2022)
Combined MASC 310 and AME 231L into a single lab course serving multiple engineering majors. Designed experiments and assisted with instrumenting and setting up the lab space.

Service

Viterbi Instructional Committee
USC Engineering Faculty Council
Viterbi Faculty Representation and Experience Working Group
Curriculum Committee, Materials Science
Viterbi Undergraduate Awards Committee
USC Undergraduate Research Associates Program Faculty Committee
Awards Chair, ASEE Materials Division
SAMPE Los Angeles Board of Directors (Student Chapter Liaison)
SAMPE North America Future Conferences and Events Committee
SAMPE Editorial Board
Faculty Advisor: Mork Family Department Master's Student Association
Town and Gown of USC Scholarship Committee

USC Student Exam Committees

Qualifying Exam

2017 Wei Hu (Advisor: Steven Nutt)
2017 Niki Bayat (Advisor: Mark Thompson)
2017 Sebastian Riano (Advisor: Andrea Hodge)
2017 Yixiang Zhang (Advisor: Seven Nutt)
2018 Chelsea Appleget (Advisor: Andrea Hodge)
2019 Alina Garcia Taormina (Advisor: Andrea Hodge)
2019 Kwangtae Son (Advisor: Michael Kassner)
2019 Sarah Schechter (Advisor: Steven Nutt)
2020 David Bender (Advisor: Steven Nutt)
2020 Hung Hwan Shin (Advisor: Steven Nutt)
2020 Daniel Zebrine (Advisor: Steven Nutt)
2023 Patricio Martinez (Advisor: Steven Nutt)

Dissertation Defense

2017 Nathan Heckman (Advisor: Andrea Hodge)
2017 Kamia Smith (Advisor: Michael Kassner)
2018 Yixiang Zhang (Advisor: Steven Nutt)
2019 Wei Hu (Advisor: Steve Nutt)
2020 Sarah Schechter (Advisor: Steven Nutt)
2020 Kwangtae Son (Advisor: Mike Kassner)
2021 David Bender (Advsior: Steven Nutt)
2022 Daniel Zebrine (Advisor: Steven Nutt)

Research Experience

University of Southern California (Aug 2015 – Present)
Affiliated faculty – M.C. Gill Composite Center
Research in composite manufacturing and mentoring of student researchers

University of Southern California (Jan 2014 – Aug 2015)
Postdoctoral Scholar
Advisor: Professor Steve Nutt – M.C. Gill Composites Center
Project: Composite processing – material efficiency and sustainable manufacturing.

University of California, Riverside (Jan 2013 - Jan 2014)
Postdoctoral Scholar
Advisor: Professor David Kisailus – Biomimetics and Nanostructured Materials Lab
Project: Investigation of structure-function relationships in biomineralizing organisms, and fabrication of bio-inspired composites.

University of Southern California (Aug 2007- Dec 2012)
Graduate Research Assistant
Advisor: Professor Steve Nutt – M.C. Gill Composites Center
Project: Parametric studies on void formation in carbon fiber epoxy composites produced using out-of-autoclave manufacturing.

Seminars and Invited Talks

1. "Active learning in introductory materials science courses: In-person and online" UC Davis Materials Science and Engineering Departmental Seminar. January 11, 2022.

Media

1. Viterbi Magazine, The Classroom Innovators, 2020

Conference Organization

- Scientific Steering Committee, North American Materials Education Symposium (NAMEs), 2023
- Division Chair, Moderator, Materials Division, ASEE 2023
- Program Chair, Moderator, Materials Division, ASEE 2020, 2021
- Moderator, "Advanced Analysis and Design," SAMPE Virtual Series, 2020
- Category Chair, "Workforce Development," SAMPE 2020
- Technical committee, "Composites and Advanced Materials Expo," CAMX 2019
- Category Chair, "Manufacturing and Processing Technologies," CAMX 2019
- Organizing team, "Symposium on Aeronautical and Aerospace Processes, Materials and Industrial Applications," SMM-SAMPE-MRS, IMRC 2016
- Category Chair, "Emerging Materials," SAMPE Long Beach, May 23-26, 2016
- Category Chair, "Sustainability: Effective Recycling of Materials," SAMPE Long Beach, May 23-26, 2016
- Category Chair, "High Temperature Systems and Structures," SAMPE Baltimore, May 18-21, 2015

Publications

17. S. Schechter, **L.K. Grunenfelder**, S.R. Nutt. Air evacuation and resin impregnation in semi-pregs: Effects of feature dimensions. Advanced Manufacturing: Polymer and Composite Sciences, 2020 DOI
16. S. Schechter, **L.K. Grunenfelder**, S.R. Nutt. Design and application of discontinuous resin distribution patterns for semi-pregs. Advanced Manufacturing: Polymer and Composite Sciences, 2020 DOI
15. W. Hu, **L.K. Grunenfelder**, T. Centea, S. Nutt. In-situ monitoring and analysis of void evolution in unidirectional prepreg. Journal of Composite Materials, 2018;52(21):2847-2858 DOI
14. **L.K. Grunenfelder**, G. Milliron, S. Herrera, I. Gallana, N. Yaraghi, N.C. Hughes, K. Evans-Ludderodt, P. Zavattieri, D. Kisailus. Ecologically driven ultrastructural and hydrodynamic designs in stomatopod cuticles. Advanced Materials, 2018;30(9) DOI
13. Y. Zhang, A. Jain, **L.K. Grunenfelder,** M. Miyauchi, S. Nutt. Process development for penylethynyl-terminated PMDA-type asymmetric polyimide composites. High Performance Polymers. 2017;30(6):731-741 DOI
12. **L.K. Grunenfelder**, A. Dills, T. Centea, S.R. Nutt. Effect of prepreg format on defect control in out-of-autoclave processing. Composites: Part A 2017;93:88-99 DOI
11. N.A. Yaraghi, N. Guarin-Zapata, **L.K. Grunenfelder**, E. Hintsala, S. Bhowmick, J.M. Hiller, M. Betts. E.L. Principe. J.Y. Jung, L. Sheppard, R. Wuhrer, J. McKittrick, P. Zavattieri, D. Kisailus. A sinusoidally architected helicoidal biocomposite. Advanced Materials 2016;28(32):6835-6844 DOI*
10. E. Escobar de Obaldia, S. Herrera, **L.K. Grunenfelder**, D. Kisailus, P. Zavattieri. Competing mechanisms in the wear resistance behavior of biomineralized rod-like microstructures. Journal of the Mechanics and Physics of Solids 2016;96:511-534 DOI
9. E. Escobar de Obaldia, C. Jeong, **L.K. Grunenfelder**, D. Kisailus, P. Zavattieri. Analysis of the mechanical response of biomimetic materials with highly oriented microstructures through 3D printing, mechanical testing and modeling. Journal of the Mechanical Behavior of Biological Materials 2015;48:70-85 DOI
8. C. Wang, **L.K. Grunenfelder**, R. Patwardhan, S. Qui, V. Eliasson. Investigation of shock wave focusing in water in a logarithmic spiral duct, Part 2: Strong coupling. Ocean Engineering 2015;102:185-196 DOI
7. T. Centea, **L.K. Grunenfelder**, S.R. Nutt. A review of out-of-autoclave prepregs – Material properties, process phenomena and manufacturing considerations. Composites: Part A 2015;70:132-154 DOI

6. **L.K. Grunenfelder,** E. Escobar de Obaldia, Q. Wang, D. Li, B. Weden, C. Salinas, R. Wuhrer, P. Zavattieri, D. Kisailus. Stress and damage mitigation from oriented nanostructures within the radular teeth of *Cryptochiton stelleri*. Advanced Functional Materials 2014;24(39):6093-6104 DOI*
5. **L.K. Grunenfelder**, S. Hererra, D. Kisailus. Crustacean derived nanostructured biomimetic composites. Small 2014;10(16):3207-3232 DOI
4. **L.K. Grunenfelder**, N. Suksangpanya, C. Salinas, G. Milliron, N. Yaraghi, S. Herrera, K. Evans-Lutterodt, S.R. Nutt, P. Zavattieri, D. Kisailus. Bio-inspired impact resistant composites. Acta Biomaterialia 2014;10(9):3997-4008 DOI
3. **L.K. Grunenfelder**, T. Centea, P. Hubert, S.R. Nutt. Tow impregnation in an out-of-autoclave prepreg as a function of room temperature aging time. Composites: Part A 2013;45:119-126 DOI
2. **L.K. Grunenfelder**, S.R. Nutt. Prepreg age monitoring via differential scanning calorimetry. Journal of Reinforced Plastics and Composites 2012;31(5):295-302 DOI
1. **L.K. Grunenfelder**, S.R. Nutt. Void formation in composite prepregs – effect of dissolved moisture. Composites Science and Technology 2010;70(16):2304-2309 DOI

*Cover article

Conference Proceedings (Presenting Author)

12. J. Galos, **L.K. Grunenfelder.** Teaching composite manufacturing: A universal design for learning approach. North American Materials Education Symposium, 2023
11. **L.K. Grunenfelder.** Introductory materials science: A project-based approach. American Society for Engineering Education, 2023
10. **L.K. Grunenfelder.** Electronic packets for content delivery, organization, and engagement. ASEE Pacific South West Conference, 2021 (extended abstract with oral presentation).
9. **L.K. Grunenfelder**. Active learning in an introductory materials course. American Society for Engineering Education, 2019
8. **L.K. Grunenfelder**, S. Katz, T. Centea, S. Nutt. Through-thickness permeable prepreg for robust vacuum bag only processing. Society for the Advancement of Material and Process Engineering (SAMPE) Technical Conference, 2017.
7. **L.K. Grunenfelder**, T. Centea, G. Riddle, S.R. Nutt. The influence of prepreg architecture on part quality for vacuum bag only processing. Society for the Advancement of Material and Process Engineering (SAMPE) Technical Conference, 2015.
6. **L.K. Grunenfelder**, C. Fisher, C. Cabble, S. Thomas, S.R. Nutt. Defect control in out-of-autoclave processing of structural elements. Society for the Advancement of Material and Process Engineering (SAMPE) Technical Conference, 2012.
5. **L.K. Grunenfelder**, R. Panikar, S.R. Nutt. TGA-FTIR analysis of out-gassing components for co-cure of sandwich structures. American Society for Composites 27th Technical Conference, 2012.
4. **L.K. Grunenfelder**, S.R. Nutt. Monitoring prepreg out-time with glass transition temperature. American Society for Composites 26th Technical Conference, 2011.
3. **L.K. Grunenfelder**, S.R. Nutt. Air removal in VBO prepreg laminates: Effects of breathe-out distance and direction. Society for the Advancement of Material and Process Engineering (SAMPE) Technical Conference, 2011.
2. **L.K. Grunenfelder**, S.R. Nutt. Out time effects on VBO prepreg and laminate properties. Society for the Advancement of Material and Process Engineering (SAMPE) Conference, 2011.*
1. **L.K. Grunenfelder**, S.R. Nutt. Moisture and pressure effects on void formation in prepreg processed composites. American Society for Composites 25th Technical Conference, 2010.*

* Best paper award winner

Conference Proceedings (Co-Author)

3. W. Hu, **L.K. Grunenfelder**, S.R. Nutt. In-situ observation of void transport during vacuum bag-only cure. SAMPE 2016.
2. X. Li, B Cheng Jin, **L.K. Grunenfelder**, M. Pratap Varma, Y. Zhang, M. Miyauchi, M. Kotaki, S.R. Nutt. Cure kinetics of a phenylethynyl-terminated PMDA-type polyimide in the polymerization of monomeric reactants (PMR) process. CAMX 2015.
1. Y. Zhang, X. Li, **L.K Grunenfelder**, M. Miyauchi, M. Kotaki, S.R. Nutt. Process optimization for phenylethynyl-terminated PMDA-type polyimide composites. CAMX 2015.

Books and Book Chapters

3. N. Kar, Y. Hu, **L.K. Grunenfelder**. Metallurgy and materials PE exam solved problems. Professional Publications, Inc. Belmont, CA, 2017.
2. P. Hubert, T. Centea, **L.K. Grunenfelder**, S.R. Nutt, J. Kratz, A. Levy. Out-of-autoclave processing. *In: Comprehensive Composite Materials II*. Elsivier, 2017
1. **L.K Grunenfelder**, S.R. Nutt. Moisture and pressure effects on void formation in prepreg processed composites. In: Alfred C. Loos, ed. *Manufacturing of Composites: Volume 6 of the American Society for Composites Series on Advances in Composites Materials*. DEStech publications, Inc. Lancaster, Pennsylvania, 2013.

Patents

S. Nutt, **L.K. Grunenfelder**, T. Centea. High-permeability composite prepreg constructions and methods for making the same. US Patent 11,213,975

Selected Presentations, Workshops, and Tutorials

14. **L.K. Grunenfelder**, J. Parr "STEM Teaching Professional Development: A Faculty Teaching Learning Program" ASEE PSW Conference, April 15th, 2023
13. T. Gregory, **L.K. Grunenfelder**, K. Walther "Using Gradescope: Grading and beyond" USC Engineering Faculty Council Instructional Committee Coffee Talk, February 3rd. 2023
12. M. Douskey, **L.K. Grunenfelder,** J. Parr "Transforming STEM Teaching Faculty Learning Program" Workshop presented at the Biennial Conference on Chemical Education, August 1st, 2022
11. **L.K. Grunenfelder** "Creation and Implementation of In-Class Activities for an Online Materials Course" Ansys Materials Intelligence Day. Virtual Conference. November 3rd, 2021
10. **L.K. Grunenfelder** "A simple and inexpensive demo for polymer mechanical properties" Presented at the American Society for Engineering Education Virtual Conference as part of the Materials Division special session "Activities with Impact," 2020
9. **L.K. Grunenfelder** "Prepreg design and fabrication for robust composite processing" ASM Orange Coast Chapter Seminar. Irvine, CA. February 19th, 2020
8. **L.K. Grunenfelder**, T. Centea. Half-day tutorial course: "Out-of-autoclave prepregs: Defect control and process efficiency" presented at the Society for the Advancement of Material and Process Engineering (SAMPE) Technical Conference, 2017.
7. S.R. Nutt, **L.K. Grunenfelder,** T. Centea. Half-day tutorial course: "Defect control in composite fabrication using out of autoclave prepregs" presented at the Society for the Advancement of Material and Process Engineering (SAMPE) Technical Conference, 2015.
6. **L.K. Grunenfelder** "The influence of prepreg architecture on part quality for vacuum bag only processing" SAMPE Orange County Chapter Seminar. November 18th, 2015.
5. **L.K. Grunenfelder,** G. Milliron, I. Gallana, N. Suksangpanya, S. Herrera, P. Zavattieri, D. Kisailus "Investigation of an impact resistant crustacean. Part 1: Ultrastructure and nanomechanics." Materials Research Society Fall Meeting. Boston, MA. December 5th, 2013.
4. **L.K. Grunenfelder,** D. Kisailus "Recent advances in biological and biomimetic composites." Composites at Lake Louise. Lake Louise, Alberta, Canada. November 7th, 2013.
3. **L.K. Grunenfelder**, C. Salinas, S. Herrera, C. Huang, D Kisailus "Toughening mechanisms of biological and biomimetic composites via interfacial engineering." 87th ACS Colloid & Surface Science Symposium. Riverside, CA. June 25th, 2013.
2. **L.K. Grunenfelder,** S.R. Nutt "Prepreg out-time and age monitoring" Northrop Grumman Lunch and Learn series. Los Angeles, California, USA. October 7th, 2011.
1. **L.K. Grunenfelder** "Science and technology of real-time dielectric cure monitoring" SAMPE Los Angeles Chapter Seminar. Los Angeles, California. February 23rd, 2010.

Awards and Honors

MFD Distinguished Early Career Award	2021
USC Center for Excellence in Teaching Faculty Fellow	2021
USC Stevens Center for Innovation 2020 Commercialization Award	2020
New Materials Educator Award, American Society for Engineering Education	2020

SAMPE Young Professionals Emerging Leadership Award	2020
SAMPE Young Professional of the year	2020
NSF-IUSE Transforming STEM Teaching Faculty Learning Program Faculty Fellow	2019
New Initiative Request: USC internal funding to support redesign of MASC 310 course	2017, 2019
Postdoctoral Travel Grant, University of Southern California Office of Postdoctoral Affairs	2015
Viterbi School of Engineering Best Thesis Award in Materials Science	2013
2nd place, Mork Family Department of Chemical Engineering and Materials Science Student Research Symposium (oral presentation)	2012
1st place. Processing category, Society for the Advancement of Material and Process Engineering Technical Conference student poster competition	2012
Achievement Rewards for College Scientists (ARCS) Scholar	2010-2012
American Society for Metals International Student Scholarship	2011
1st place, American Society for Metals International, Los Angeles Chapter, Student Night oral presentation competition	2011
1st place, Society for the Advancement of Material and Process Engineering Graduate/Senior Student Award (oral presentation)	2011
1st place, Outstanding Paper Award, Society for the Advancement of Material and Process Engineering Conference	2011
Best Paper Award, 25th American Society for Composites Technical Conference	2010

Professional Development

USC CET Advanced Faculty Institute: Maximizing Course Accessibility by Minimizing Academic Ableism Participant in a semester long course covering creation of accessible digital course materials and designing inclusive course environments.	Fall 2023
FLP Equity and Inclusion in STEM Teaching Participant in a 4-week conversation series on anti-racist and culturally responsive teaching in STEM.	March-May, 2021
Faculty Teaching Learning Program Co-Facilitator Leading a cohort of 10 STEM faculty members, from the engineering school and the college, through a program aimed at enhancing undergraduate teaching. Consulting on course design and facilitating peer observation.	August 2020-Present
USC Center for Excellence in Teaching Faculty Fellows Leadership Institute Appointed by the Dean to become a teacher-leader via a yearlong institute geared toward developing practices, initiatives, and policies to further their schools' goals toward teaching excellence.	August 2020-May 2021
Project Catalyst Workshop: "How to Engineer Engineering Education" Two-day virtual workshop on how to facilitate active learning and laboratory learning in an online environment	July 14-15, 2020
USC Center for Excellence in Teaching Accelerated Online Teaching Institute Summer institute with weekly Zoom meetings, focused on online pedagogies	July-August, 2020
Transforming STEM Teaching Faculty Learning Program (FLP) Yearlong professional learning program for STEM educators aimed at improving instruction and student achievement in undergraduate STEM courses	January 2019-December 2019
National Effective Teaching Institute (NETI-2) Two-day workshop on cooperative learning and inductive teaching and learning	June 13-14, 2019
National Effective Teaching Institute (NETI-1) Three-day workshop on effective teaching – course planning, lecturing, active learning and assessment	June 23-25, 2016

CES EduPack Short Course, Berkeley, CA — March 16, 2016
Short course offered by Granta Design and Mike Ashby as part of the 2016 North American Materials Education Symposium introducing new ways to utilize material selection software in undergraduate courses.

Integrated Computational Materials Education Summer School, Santa Barbara, CA — July 14-18, 2014
NSF sponsored short course deigned to introduce attendees to available tools (Nanohub and Thermocalc) to incorporate computational tools into materials science curriculum.

NSF Workshop for Developing and Sustaining Productive Graduate Research Groups in Engineering, Arlington, VA — July 11-12, 2011
Workshop for Ph.D. students, postdocs, and early faculty on establishing and effectively managing university research groups

Composites Design Workshop, Stanford Continuing Studies Program — Fall 2009
Online intensive short course on composite design

STEM Outreach

SAMPE Student Programs — 2015-Present
Judge for the student research symposium (undergraduate, maters and PhD levels)

USC MWLB/SWE/WIM Boeing Conference — April 4th, 2023
Engineering faculty representative for industry-specific mingling at the Boeing Conference

Keynote Speaker, Society of Hispanic Professional Engineers (SHPE) — November 17, 2017
Women discover engineering day

Keynote Speaker, Society of Women Engineers (USC) — April 15, 2016
High school conference

Panelist, Mork Family Department Masters Student Association — April 14, 2016, October 20, 2016
Alumni panel discussion

STEM Spotlight: Mork Family Department — Oct 22, 2015
K-12 student tours and demos to highlight Chemical Engineering and Materials Science

Grand Awards Judge, Intel International Science and Engineering Fair — May 13-14, 2014, May 16-17, 2017
Bioengineering and Materials Science (2014) and materials science (2017) category judge

Volunteer, Pre-MESA Day — March 8, 2014
Judging the EggXpress egg drop competition for middle school and high school students, helping to facilitate preliminary student competitions

Judge, California State Science Fair
Display approval committee member and category judge for materials science junior division (2011). Category chair, materials science junior division (2012, 2014). Project of the year judge (2014)

Judge, Los Angeles County Science Fair — 2012, 2014, 2015
Category chair, materials science junior division

"Design by Nature" at the Riverside Municipal Museum — May 18, 2013
Facilitating technical presentations to the public by undergraduate researchers and practical demonstrations by local middle school students

Delegate (University of California), Coalition for National Science Funding (CNSF) Day — May 7, 2013
Representing the UC system in discussions with senators and congress members in Washington, D.C., presenting research at the CNSF exhibition "Investments in STEM Research and Education: Fueling American Innovation"

Professional and Philanthropic Societies

- American Society for Engineering Education (ASEE)
- Society for the Advancement of Material and Process Engineering (SAMPE)
- Town and Gown of USC