DR. YOGESH **SINGH**

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EXPERIENCE

AUGUST 2022 – PRESENT

ASSISTANT PROFESSOR OF ENGINEERING INSTRUCTION,

DEPARTMENT OF MECHANICAL ENGINEERING

UNIVERSITY OF AKRON, AKRON, OHIO, USA

AUGUST 2021 – MAY 2022

VISITING ASSISTANT PROFESSOR OF INSTRUCTION,

DEPARTMENT OF MECHANICAL ENGINEERING

UNIVERSITY OF AKRON, AKRON, OHIO, USA

NOVEMBER 2015 – MAY 2021

RESEARCH ASSOCIATE/RESEARCH ASSISTANT PROFESSOR, UNIVERSITY OF AKRON

Serving in the role of Research Assistant Professor my job description included teaching several undergraduate courses each semester in the Department of Mechanical Engineering and performing research in the field of ceramic matrix composites (CMCs). My research responsibilities included designing and performing experiments relevant to CMCs, detailed study of their electrical properties, and assisting graduate students in different projects. Some of the important results from my research in this role are as under:

- Modelling the spreading of DC current in 2D-woven ceramic matrix and polymer matrix composite to extract information about delamination and to estimate the out-of-plane resistivity of composites.
- Developing the method of multi-lead DC electrical resistance for in-situ damage monitoring of SiC-SiC and C-SiC based composites at both ambient temperature and elevated temperature.
- Developing and implementing a DC electrical resistance-based technique to determine the crack length in interlaminar testing of electrically conducting and non-conducting (oxide-based) ceramic matrix composites at both ambient temperature and elevated temperature.
- Developing and implementing the technique to evaluate the through-thickness DC electrical resistance of composite materials.
- Electrical resistance derivative-based method to localize the cracks during failure of composite structures.
- Studying the intricacies specific to understanding microstructure/property relationships of ceramic matrix composites [CMC's].
- Utilizing the combination of acoustic emission (AE), digital image correlation (DIC), and DC electrical resistance techniques for damage determination and general monitoring of composites and metals.

TEACHING / INSTRUCTION:

Courses taught at Undergraduate Level (13 Different courses in last 5 years)

Mechanical Engineering Lab (Materials Testing Lab), Engineering Analysis II (Online Asynchronous), Engineering Analysis I, Kinematics, Heat Transfer, Fluid Mechanics I, Thermodynamics I, Thermal Science, Introduction to Materials Science and Engineering, Dynamics, Mechanical Metallurgy, Fundamentals of Engineering Drawing, Economics of Technology, Introduction to Materials Technology Lab, Manufacturing Processes.

RECENT TEACHING EVALUATIONS (Evaluations were not provided for Spring and Summer 2020 due to COVID)

Course	Term	Instructor Average (on a scale of 5.0)	Department Average. (on a scale of 5.0)
Fundamentals of Engineering Drawing	Spring 2022	4.731	NA
Fundamentals of Engineering Drawing	Spring 2022	4.8	NA
Introduction to Materials Technology (LAB)	Spring 2022	4.2	NA
Economics of Technology	Spring 2022	4.524	NA
Kinematics	Fall 2021	4.75	NA
Fundamentals of Engineering Drawings	Fall 2021	4.883	NA
Thermodynamics I	Spring 2021	4.467	4.112
Thermal Science	Spring 2021	4.317	4.112
Thermodynamics I	Fall 2020	4.534	4.090
Engineering Analysis II	Fall 2020	3.982	4.090
Kinematics	Fall 2019	4.023	NA
Kinematics	Fall 2019	4.105	NA
Introduction to Material Science & Engineering	Summer 2019	4.481	3.695
Heat Transfer	Spring 2019	4.492	4.150
Thermodynamics I	Fall 2018	4.692	4.044
Fluid Mechanics I	Fall 2018	4.577	4.044
Introduction to Material Science & Engineering	Summer 2018	4.382	3.940
Heat Transfer	Spring 2018	4.174	4.007
Thermodynamics I	Fall 2017	4.302	3.979
Fluid Mechanics I	Fall 2017	4.250	3.979
Thermal Science	Summer 2017	4.406	3.840

RESEARCH

- Worked on several industry-sponsored projects aimed toward damage characterization in ceramic matrix composite (CMC) materials. This includes projects funded by General Electric (GE), Rolls Royce (RR), Alpha STAR, and the Office of Naval Research (ONR), among others.

- Gained extensive experience in several experimental techniques including a Universal Testing System (UTS), Acoustic Emission (AE) system, Digital Image Correlation (DIC) system, and Direct Current Potential Drop (DCPD) Measurement system.

- Developed a DCPD-based technique for monitoring damage initiation and progression in CMC and CFRP materials.

- Studied the mechanical and electrical behavior in a variety of CMC and CFRP materials.

- Developed proof of concept to use DCPD as a probe in health monitoring and quality control of CMC and CFRP materials. This includes the detection of delamination in and measurement of out-of-plane electrical resistivity of composite materials.

- Published 15 peer-reviewed articles in international journals.

SERVICE

- Served as a reader for Senior Design Project on several occasions.

- Served as co-advisor on one of the Senior Design Projects.

- Hosted the Summer camp for "Women in Engineering" participants from local middle and high schools.

- Serving Member of the MET Industrial Advisory Committee.

- Serving Member of Assessment Peer Review Group, University of Akron.

- In charge of Chemical Inventory management, MET, University of Akron.

- Reviewer for more than 10 international journals in Physics and Mechanical Engineering.

EDUCATION

AUGUST 2015

DOCTOR OF PHILOSOPHY [PHD, PHYSICS]

KENT STATE UNIVERSITY, USA

- GPA: 3.8.
- Published 9 journal papers based on Ph.D. work.
- Presented my research work at 8 international conferences.
- Was awarded a competitive University Fellowship for research.

MAY 2009

MASTER OF TECHNOLOGY [MTECH, MATERIALS SCIENCE & TECHNOLOGY, INDIAN INSTITUTE OF TECHNOLOGY, VARANASI, INDIA

- GPA: 9.5/10.
- Was awarded Institute Gold Medal for standing first in class.
- Recipient of General Electric (GE) fellowship for scholarship.

MAY 2003

MASTER OF SCIENCE [MSC, PHYSICS]

BANARAS HINDU UNIVERSITY, VARANASI, INDIA

- Percentage 60.5%
- Passed in First Class.

MAY 2001

BACHELOR OF SCIENCE [BSC]

VEER BAHADUR SINGH PURVANCHAL UNIVERSITY, JAUNPUR, INDIA

- Percentage 65.2%
- Passed in First Class.
- First Rank in College.

SKILLS

- Experienced in developing and applying electrical resistance methods to locate and monitor cracks in polymer matrix composites, ceramic matrix composites, and other anisotropic materials.

- Experienced in using an Acoustic emission system to study the damage profile in a material.

- Experienced in performing high-temperature (~ 1200^{o}C) tests for studying electrical and mechanical properties of ceramic matrix composites at elevated temperatures.

- Experience with traditional powder metallurgical methods (solid state diffusion synthesis, sintering, ball milling, pellet pressing.

- Experience in materials characterization techniques including powder XRD (some experience with structural characterization using Rietveld Refinement) and DSC.

- Experience with utilizing digital image correlation (DIC) technique in damage monitoring in materials.

- Experienced in performing low-temperature measurements in Physical Property Measurement System (PPMS) and Magnetic Property Measurement System (MPMS) including electrical transport, heat capacity, torque magnetometry, and magnetizations.

- Experienced in scientific and engineering software including AutoCAD, Solidworks, MatLab, OriginLab, and Excel among others.

- Experienced in operating and maintenance of Instron and MTS loading systems for mechanical testing.

REVIEWER FOR SCIENTIFIC AND TECHNICAL JOURNALS (20 REVIEWS)

- Physical Review Letters.
- Physical Review B.
- Composite Science and Technology.
- Sensors.
- Bioengineering.
- Materials.
- Applied Sciences.
- Coatings.
- Metals.
- Composites Part A.
- Composite Science and Technology.
- Measurements.
- International Journal of Applied Ceramic Technology.

SIGNIFICANT RESEARCH CONTRIBUTIONS

- Proposed a new magnetoresistance-based method to probe quantum criticality in heavy fermion superconductors.
- Established the role of Yb valence state in robust coherence and rapidly disappearing superconductivity as a function of Yb doping in heavy fermion material Ce1-xYbxCoIn5.
- Highlighted the transition of Ce1-xYbxCoIn5 materials from Kondo local moment to mixed valence regime and used this to emphasize the decoupled superconductivity and coherence.
- Explained many of the properties of Ce1-xYbxCoIn5 which are unusual to similar heavy fermion systems.
- Proposed the electric and magnetotransport properties-based methods to study the quantum phase transitions masked by superconductivity in heavy fermion and similar materials.
- Developed an electrical resistance-based ladder network model to understand the spreading of DC current in 2D-woven ceramic matrix and polymer matrix composite materials.
- Used the ladder resistor network model to accurately determine the presence of delamination in ceramic matrix composite materials.
- Used the ladder resistor network model to accurately determine the out-of-plane resistivity of conducting composite materials.
- Developed the method of multi-lead DC electrical resistance for in-situ damage monitoring of SiC-SiC and C-SiC based composites at both ambient temperature and elevated temperature.
- Developed the direct current potential drop method to monitor crack initiation and growth in non-conducting (oxide-based) ceramic matrix composites at both ambient temperature and elevated temperature.
- Developed the technique to utilize the direct current potential drop method and acoustic emission method to identify the type of damage (matrix or fiber) in the loading of a ceramic matrix composite.

ACADEMIC RECOGNITIONS

- **Session Chair Processing-Microstructure-Mechanical Properties Correlation** 43rd International Conference and Exposition on Advanced Ceramics and Composites **(ICACC, 2019)**

- **ASME IGTI Committee Best Paper Award** **2017.**
  ASME Turbo Expo 2017: Turbomachinery Technical Conference and Exposition (GT2017).

- **Global Graduate Researcher Network award for best poster** **2016.**
  9th International Conference on High Temperature Ceramic Matrix Composites, Toronto, Canada (2016).

- **University Fellowship** **2014.**
  Kent State University, Kent, Ohio, USA
  Awarded annually to advanced doctoral students to recognize excellent scholarship and research potential.

- **Institute for Complex Adaptive Matter (ICAM) Travel award (USA)** **2013.**
  6th I2CAM/FAPERJ Spring School, New Perspectives in Quantum Matter, Rio, Brazil, to participate in a week-long summer school focusing on the contemporary issues in condensed matter physics.

- **Institutes Gold Medal** **2009.**
  Indian Institute of Technology Varanasi, India
  First rank in MTech program.

- **GE (General Electric) Foundation Fellowship (India)** **2008.**
  The GE Foundation Scholar-Leaders Program provides financial support and leadership development to talented students enrolled in engineering, technology, or business management programs.

RESEARCH PUBLICATIONS

1. A. Gupta, Y. P. Singh, & G. N. Morscher. The use of electric potential drop techniques to detect delamination in a melt-infiltrated SiC-based composite. International Journal of Applied Ceramic Technology, 19(2), 1092-1106. (2022)
   Impact Factor: 1.968

2. R. Panakarajupally, J. Elrassi, K. Manigandan, Y. P. Singh G. N. Morscher Monitoring Damage in Non-Oxide Composites at High Temperatures Using Carbon-Containing CVD SiC Monofilament Fibers as Embedded Electrical Resistance Sensors. Journal of Engineering for Gas Turbines and Power, 143(5), 051027. (2021)
   Impact Factor: 1.209

3. Y. P. Singh, R. Panakarajupally, M. J. Presby, G. N. Morscher, Interlaminar damage detection through the understanding of direct current spreading in continuous fiber reinforced composites. Composites Part B: Engineering, 166, 722-730 (2019).
   Impact Factor: 9.078

4. Y. P. Singh, M. J. Presby, K. Manigandan, and G. N. Morscher: Multilead direct current potential drop method for in-situ health monitoring of ceramic matrix composites, ASME. J. Engineering Gas Turbines Power 141(3) (2019).
   Impact Factor: 1.209

5. Sulochana Shrestha, K. Manigandan, Michael Presby, Yogesh Singh, Gregory Morscher: In-situ fatigue life analysis of steel using modal acoustic emission and electrical resistivity techniques, MS&T Conference Proceedings (2017).

6. Y. P. Singh, R. B. Adhikari, D. J. Haney, B. D. White, M. B. Maple, M. Dzero, & C. C. Almasan, Zero-field quantum critical point in Ce 0.91 Yb 0.09 CoIn5. Physical Review B, 97, 184514 (2018).
   Impact Factor: 4.036

7. R. Mansour, Y. P. Singh, G. N. Morscher, F. Breede, D. Koch, Determination of out-of-plane electrical resistivity for non-oxide ceramic matrix composites. Int J Applied Ceramic Technology, 15(4), 1040-1046. (2018). (The article was highlighted by Ceramic Tech Today, an electronic publication of The American Ceramic Society compiled by the editors of The American Ceramic Society Bulletin).
   Impact Factor: 1.968

8. Y. P. Singh, M. J. Presby, K. Manigandan, & G. N. Morscher. Use of electrical resistance as a non-destructive evaluation tool in health monitoring and damage evaluation of ceramic matrix composites. In Proceedings of the 41st international conference on advanced ceramics and composites (Vol. 613, p. 89). John Wiley & Sons. (2018)

9. Yogesh P. Singh, Rabih Mansour, Gregory N. Morscher, Combined acoustic emission and multiple lead potential drop measurements in detailed examination of crack initiation and growth during interlaminar testing of ceramic matrix composites, Composites Part A: Applied Science and Manufacturing, 97, 93- 99, (2017).
   Impact Factor: 7.664

10. R. Mansour, Y. P. Singh, K. Manigandan, G. N. Morscher, F. Abdi, J. Ahmad, C. Godines, S. DorMohammadi, S. Choi, Study of interlaminar fracture properties of ceramic matrix composites at room and elevated temperatures. ASME. Turbo Expo: Power for Land, Sea, and Air, Volume 6: Ceramics; Controls, Diagnostics, and Instrumentation; Education; Manufacturing Materials and Metallurgy (2017).
    Impact Factor: N/A

11. X. Y. Huang, Y. P. Singh, D. J. Haney, T. Hu, H. Xiao, Hai-Hu Wen, S. Zhang, M. Dzero, C. C. Almasan, Relationship between critical current and flux-flow resistivity in the mixed state of Ba(Fe1-xCox)2As2, Phys. Review B 96, 094509(2017).
    Impact Factor: 4.036

12. X. Y. Huang, D. J. Haney, Y. P. Singh, T. Hu, H. Xiao, Hai-Hu Wen, M. Dzero, C. C. Almasan, Universality and unconventional enhancement of flux-flow resistivity in Ba(Fe1-xCox)2As2, Phys. Review B. 95, 184513 (2017).
    Impact Factor: 4.036

13. Y. P. Singh, R. B. Adhikari, S. Zhang, K. Huang, D. Yazici, I. Jeon, M. B. Maple, M. Dzero, and C. C. Almasan, Multiband superconductivity in the correlated electron filled skutterudite system Pr1-xCexPt4Ge12, Phys. Review B 94, 144502 (2016).
    Impact Factor: 4.036

14. Shuai Zhang, Y. P. Singh, X. Y. Huang, X. J. Chen, M. Dzero, C. C. Almasan, Orbital and Pauli limiting effects in heavily doped Ba1-xKxFe2As2, Phys. Review B 92, 174524 (2015).
    Impact Factor: 4.036

15. Y. P. Singh, D. J. Haney, X. Y. Huang, B. D. White, M. Dzero, M. B. Maple, and C. C. Almasan, Pressure studies of the quantum critical alloy Ce0.93Yb0.07CoIn5, Phys. Rev. B 91, 174506 (2015).
    Impact Factor: 4.036

16. Y. P. Singh, D. J. Haney, B. D. White, M. Dzero, M. B. Maple, and C. C. Almasan, Quantum criticality and superconducting pairing in Ce1-xYbxCoIn5 alloys, J. Phys. Conf. Series, 592, 012078 (2015).

17. Y. P. Singh, D. J. Haney, X. Y. Huang, I. K. Lum, B. D. White, M. Dzero, M. B. Maple, and C. C. Almasan, From local moment to mixed-valence regime in Ce1- xYbxCoIn5 alloys, Phys. Review, B 89, 115106 (2014).
    Impact Factor: 4.036

18. Y. P. Singh*, T. Hu, L. Shu, M. Janoschek, M. Dzero, M. B. Maple, and C. C. Almasan, Non-Fermi liquid regimes with and without quantum criticality in Yb- doped CeCoIn5, Proc. National Academy of Sciences, 110, 7160-4 (2013). (*Equal contribution with T. Hu).
    Impact Factor: 11.205

19. H. Xiao, T. Hu, S. K. He, B. Shen, W. J. Zhang, B. Xu, K. F. He, J. Han, Y. P. Singh, H. H. Wen, X. G. Qiu, C. Panagopoulos, C. C. Almasan, Filamentary superconductivity across the phase diagram of Ba(Fe,Co)2As2, Phys. Review B 86, 064521 (2012).
    Impact Factor: 4.036

PRESENTATIONS

- Study of direct current spreading in ceramic matrix composites, 43rd International Conference and Expo on Advanced Ceramics and Composites, Daytona Beach, FL, USA (2019).

- Out-of-plane electrical transport properties in conducting ceramic matrix composites, 42nd International Conference and Expo on Advanced Ceramics and Composites, Daytona Beach, FL, USA (2018).

- Damage Evaluation of Ceramic Matrix Composites during Tension-tension Fatigue Loading using Non-destructive Health Monitoring Tools, 42nd International Conference and Expo on Advanced Ceramics and Composites, Daytona Beach, FL, USA (2018).

- Electrical Resistance as an NDE tool for damage detection and health monitoring in Ceramic Matrix Composites, 41st International Conference and Expo on Advanced Ceramics and Composites, Daytona Beach, FL, USA (2017).

- Quantum criticality and unconventional properties of heavy fermion superconductor Ce1-xYbxCoIn5, (Invited Talk) Department of Physics, Rice University, Houston, TX, USA (2015).

- Pressure studies of the quantum critical alloy Ce0.93Yb0.07CoIn5, March meeting of the American Physical Society, San Antonio, TX, USA (2015).

- Magnetic fluctuations under the SC dome of Ba(Fe1-xCox)2As2 from flux flow resistivity, March meeting of the American Physical Society, San Antonio, TX, USA (2015).

- From local moment to mixed valence regime in Ce1- xYbxCoIn5 alloys, March meeting of the American Physical Society, Denver, CO, USA (2014).

- Non-Fermi liquid regimes with and without quantum criticality in Yb doped CeCoIn5, March meeting of the American Physical Society, Baltimore, MD, USA (2013).

- Magnetic fluctuations under the superconducting dome on single crystals of Ba(Fe1-xCox)2As2, March meeting of the American Physical Society, Baltimore, MD, USA (2013).

- Non-Fermi liquid regimes with and without quantum criticality in Yb-doped CeCoIn5.
(Poster Presentation) 6th I2CAM/FAPERJ Spring School, New Perspectives in Quantum Matter, Rio, Brazil (2013).

- Field induced QCP in Yb- doped CeCoIn5, March meeting of the American Physical Society, Boston, MA, USA (2012).