

CHIRAG GOEL

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Educational Qualification

Ph.D. (Material Science & Engineering) Advisor: Prof. Venkat Selvamanickam University of Houston, Houston, TX	GPA: 3.90/4.00	Aug 2021-May2025
M.S. (Mechanical Engineering) University of Houston, Houston, TX	GPA: 3.42/4.00	Aug2018-May2020
B. Tech. (Mechanical Engineering) DCR University of Science and Technology, Haryana, India (A Public State University, Govt. of Haryana)	GPA: 8.19/10.00 (Hons.)	Jul 2010-May2014

Professional Experience

Research Assistant (Ph.D.), Selva Research Group *Aug2021-present*
University of Houston, Houston, Texas

- Experience in thin film deposition of High Temperature Superconductors (REBCO) tapes with advanced MOCVD
- Responsible for scaling up the HTS REBCO tapes manufacturing process to 50 m+ from pilot scale AMOCVD machine
- Successfully demonstrated 50 m+ long length REBCO tapes using A-MOCVD for electric motor & fusion applications
- Actualized process control optimization of HTS tapes from multiple process parameters for long length tapes
- Led complete tool ownership of the Pilot Scale Advanced MOCVD system
- Responsible and part of 4 member team for a \$4.5 million project for manufacturing of long length superconductor tapes

Researcher II, Energy Devices Fabrication Laboratory *June2020-Aug2021*
University of Houston, Houston, Texas

- Experience in making hardware modifications and troubleshooting CVD and PVD systems
- Designed a specialized heater to resolve the arcing defects in Pilot A-MOCVD production line system
- Assisted in optimizing design and modified process chamber in MOCVD reactor to improve precursor efficiency
- Trained many Research Assistants on Pre- and Post-processing of HTS

Research Assistant (M.S.), Selva Research Group *Oct2018-May2020*
University of Houston, Houston, Texas

- Experience in Pre- and Post-characterization of thin film HTS (REBCO) tapes with advanced MOCVD.
- Operated PVD using magnetron sputtering for deposition Ag shunt layer on coated conductors.
- Analyzed HTS tapes by measuring critical transport current and temperature, Scanning Hall Probe Microscope Measurement.

Design Quality Engineer *Sep2014-Jul2018*
New Product Development Projects, TCS, New Delhi, India

- Prepared product performance analysis report and design matrix (dFMEA)
- Reviewed and approved drawings, product inspection methods, related Gage R&R studies and process capability studies for critical features and control plans
- Created quality acceptance criteria to be used for incoming quality control
- Maintained and defined quality management standards including creating SPC charts using Minitab for robust quality control.
- Provided support for Risk Management executions to drive consistent Risk Assessments
- Worked on Manufacturing transfer plans, CAPA and Non-Conformance records for projects
- Supported New Product Development and current program changes including PPAPs and change request for production issues
- Led and assisted project teams to implement, standardize, and sustain process inefficiencies while reducing variation

Recovery of Steam Condensate from Block-3 in BHEL *Jun2013-Jul2013*
Bharat Heavy Electricals Limited (BHEL), Bhopal, India

- Designed a new scheme of pipeline under the guidance of Engineer-in-charge.
- Reduced the operation of Demineralized water treatment plant to one shift from the earlier two shifts in a day and resulted into saving of money and manpower.

Study of CNC Machines in Machine Shop, SBU-R (Strategic Business Unit- Radar) *Jun2012 -Jul2012*
Bharat Electronics Limited (BEL), Ghaziabad, India

- Worked with manufacturing high-precision CNC and other special purpose machines and its fabricated parts.
- Observed manufacturing of solar photovoltaic systems, semiconductors, solar-powered traffic signal systems, naval systems, Internal Environment Monitoring and Control (IEMC).

Technical Skills

- **Trained on:**

AMOCVD, Sputtering, Electroplating, SEM, 2D- XRD, PPMS, Profilometer, Optical Microscopy, Laser Slitting, ICP-MS, EDX, Wet Etching, Glove-box
Origin, Grafana, Gantt Project, Microsoft Office, Pandas, SolidWorks, Matlab

List of Publications

1. **Goel C.**, Paidpilli M., Chen S., Li Y., Oad M., Zhu L.,Majkic G., and Selvamanickam V. (2024), “*Correlations Between In-Line X-ray Diffraction Data and In-Field Critical Current of Long, 4- μ m Thick Film REBCO Tapes Made by Advanced MOCVD*”, IEEE Trans. Appl. Supercond. DOI: 10.1109/TASC.2024.3503535
Contribution: First Author, Fabrication and Characterization of REBCO tape, Data Processing
2. Kashikhin V., Cohan S., DiMarco J., Kiemschies O., Krave S., Lombardo V., Marinozzi V., Orris D., Stoynev S., Turrioni D., Chavda A. K, Sambangi U., Korupolu S., Peram J., Arjun A., **Goel C.**, Sandra J., Yerraguravagari V., Schmidt R., Selvamanickam V., Majkic G., Galstyan E., Mai N. and Selvamanickam K. (2024), “*Re-assembly and test of a COMB dipole magnet with STAR wires*”, IEEE Trans. Appl. Supercond. vol.35, no.5. DOI: 10.1109/TASC.2024.3514598
Contribution: Fabrication and Characterization of REBCO tape, Data processing
3. Peng S., Mai L., Lin Y., Feng Q., Fu W., Chen S., Paidpilli M., **Goel C.**, Galstyan E., and Selvamanickam V. (2024), “*Autoregressive distributed lag-based dynamic uniformity modeling and monitoring approaches for superconductor manufacturing*”, International Journal of Computer Integrated Manufacturing, DOI: [10.1080/0951192X.2024.2406792](https://doi.org/10.1080/0951192X.2024.2406792)
Contribution: Fabrication and Characterization of REBCO tape, Data processing
4. Adhikari K., Xiang Y., Lin Y., Feng Q., Chen S., Paidpilli M., **Goel C.**, and Selvamanickam V. (2024) “*GIFR: A Graph-Informed Functional Regression Model for Process-Structure-Property Relationships*”, Proc. Institute of Industrial and Systems Engineers (IISE)- Annual Conference and Expo.
Contribution: Fabrication and Characterization of REBCO tape, Data processing
5. Xiang Y., Adhikari K., Lin Y., Feng Q., Chen S., Paidpilli M., **Goel C.**, and Selvamanickam V. (2024) “*A Novel Roughness-based Metric for Uniformity Modelling and Monitoring in High-Temperature Superconductor Manufacturing*”, Proc. Institute of Industrial and Systems Engineers (IISE)- Annual Conference and Expo.
Contribution: Fabrication and Characterization of REBCO tape, Data processing
6. Mai L., Lin Y., Feng Q., Chen S., Paidpilli M.; **Goel C.**, and Selvamanickam V. (2024) “*AMED: Unveiling Complex Relationships in Manufacturing Processes through Attention-based Modelling of Deviant Events*”, Proc. Institute of Industrial and Systems Engineers (IISE)- Annual Conference and Expo.
Contribution: Fabrication and Characterization of REBCO tape, Data processing
7. Castaneda N., Majkic G., **Goel C.**, Francisco R., and Selvamanickam V. (2024) “*Scanning Raman Spectroscopy Characterization of 1 Meter Long REBCO Coated Conductor*”, Proc. Intl. Cryogenic Engineering Conf.- IOP Conference Series: Materials Science and Engineering 1301. DOI: 10.1088/1757-899X/1302/1/012012
Contribution: Fabrication and Characterization of REBCO tape, Data processing
8. Kashikhin V., Cohan S., Lombardo V., Turrioni D., Mai N., Chavda A., Sarangi U., Korupolu S., Peram J., Anil A., **Goel C.**, Sandra J., Yerraguravagari V., Schmidt R., Selvamanickam V, Majkic G, Galstyan E. and Selvamanickam K. (2024), “*Accelerator Magnet Development Based on COMB Technology with STAR Wires*”, Proc. Intl. Cryogenic Engineering Conf.- IOP Conference Series: Materials Science and Engineering 1301, DOI: 10.1088/1757-899X/1301/1/012153
Contribution: Fabrication and characterization of REBCO tape used in making STAR Wires, Data processing
9. Mai L., Lin Y., Feng Q., Fu W., Peng S., Chen S., Paidpilli M.; **Goel C.**, Galstyan E., and Selvamanickam V. (2024), “*Quantile-Regression-Enriched Event Modeling Framework for Dropout Analysis in High-Temperature Superconductor Manufacturing*”, Journal of Intelligent Manufacturing., DOI: 10.1007/s10845-024-02358-7
Contribution: Fabrication and Characterization of REBCO tapes, Data processing
10. Paidpilli M., **Goel C.**, Sarangi B., Chen S., Galstyan E., Jaroszynski J., Bradford G., Abraimov D. and Selvamanickam V. (2024) “*40-meter-long REBCO Tapes with Critical Current Over 4,000 A/12 mm at 4.2 K and 13 T by Advanced MOCVD*”, Superconductivity, DOI: 10.1016/j.supcon.2023.100081
Contribution: Fabrication of 40-m REBCO tape by AMOCVD, Optimization of the process parameters and the precursor composition, Characterization of REBCO sample which includes PPMS measurement, First draft of the manuscript was written by Mahesh Paidpilli and Chirag Goel
11. Feng Q., Peng S., Lin Y., Chen S.; Paidpilli M., **Goel C.**; Galstyan E., and Selvamanickam V. (2023), “*Reinforcement Learning for Real-time Process Control in High-Temperature Superconductor Manufacturing*”, International Journal of Advanced Manufacturing Technology, DOI: 10.1007/s00170-023-12369-y

Contribution: Processing and Characterization of REBCO tape by AMOCVD, Data processing and collection

12. Paidpilli M., Sandra J, Sarangi B., **Goel C.**, Galstyan E., Majkic G., and Selvamanickam V. (2023), "*High-Current, Double-Sided REBCO Tapes by Advanced MOCVD*", Supercond. Sci. Technol., vol. 36.
DOI: 10.1088/1361-6668/ace8c8
Contribution: Characterization of REBCO tapes, Data processing
13. Galstyan E., Kadiyala J., Paidpilli M., **Goel C.**, Sandra J., Yerraguravagari V., Majkic G., Jain R., Chen S., Li Y., Schmidt R., Jaroszynski J., Bradford G., Abraimov D., Chaud X., Song J. and Selvamanickam V. (2023) "*High critical current STAR® wires with REBCO tapes by advanced MOCVD*" Supercond. Sci. Technol., vol. 36, no. 5.
DOI: 10.1088/1361-6668/acc4ed
Contribution: Fabrication and characterization of REBCO tape used in making STAR wires, Data processing
14. Paidpilli M., **Goel C.**, Chen S., Li Y., Jain R., Shyam V., Oad M., Yerraguravagari V., Galstyan E., Majkic G., Schmidt R., Rey C., Carnes T. and Selvamanickam V. (2023) "*Development of 50-meter RE-Ba-Cu-O tapes with critical current over 1750 A/12mm at 65 K, 0.25 T by Advanced-MOCVD*" , IEEE Trans. Appl. Supercond., vol.33, no.5.
DOI: 10.1088/1361-6668/ace8c8
Contribution: Scale up the fabrication process of REBCO tape by AMOCVD from 73 cm to 50 m, Optimization of the process parameters and the precursor composition, Characterization of REBCO sample which includes PPMS measurement, ICP and 2D-XRD, First draft of the manuscript was written by Mahesh Paidpilli and Chirag Goel
15. Li Y., Chen S., Paidpilli M., Jain R., **Goel C.** and Selvamanickam V., (2022) "*A reel-to-reel scanning Hall probe microscope for characterizing long REBCO conductor in magnetic fields up to 5 Tesla*", IEEE Trans. Appl. Supercond., vol.32, no.4. DOI: 10.1109/TASC.2022.3140688
Contribution: Fabrication and characterization of REBCO tape used for 5T measurement
16. Chen S., Majkic G., Jain R., Pratap R., Mohan V., **Goel C.**, and Selvamanickam V., (2021) "*Scale up of high-performance REBCO tapes in a pilot-scale Advanced MOCVD tool with in-line 2D-XRD system*", IEEE Trans. Appl. Supercond., vol.31. DOI: 10.1109/TASC.2021.3058868
Contribution: Fabrication and characterization of REBCO tape used for in-line 2D-XRD measurement
17. Paidpilli M., Pratap R., Kochat M., Galstyan E., **Goel C.**, Majkic G. and Selvamanickam V., (2021) "*Growth of High-Performance 4-5 μm Thick Film REBCO Tapes Doped with Hafnium Using Advanced MOCVD*", IEEE Trans. Appl. Supercond., vol.31, no. 5. DOI: 10.1109/TASC.2021.3060366
Contribution: Processing and Characterization of REBCO tape, Data processing
18. Majkic G., Pratap R., Paidpilli M., Galstyan E., Kochat M., **Goel C.**, Kar S., Jaroszynski J., Abraimov D. and Selvamanickam V. (2020) "*In-Field Critical Current Performance of 4.0 μm Thick Film REBCO Conductor with Hf Addition at 4.2K and Fields up to 31.2 T*", Supercond. Sci. Technol., vol. 33, no. 7. DOI 10.1088/1361-6668/ab9541.
Contribution: Characterization of REBCO tape, Data processing

Conferences, Seminars and Workshops

- Attended and presented the research on the 2nd TcSUH Fall Welcome and Student Scholarship Symposium held at the University of Houston, TX, USA. **Sep. 13, 2024**
- Attended and presented the paper, "*Superior Critical Current of long, 4 μm thick film REBCO tapes by Advanced-MOCVD*," Applied Superconductivity Conference, Salt Lake City, USA. **Sep. 1-6, 2024**
- Attended and presented, "*Superior critical current of long length tapes by A-MOCVD*" at the 59th TcSUH Student Research Symposium held at University of Houston, TX, USA. **Apr. 18, 2024**
- Attended and presented, "*Manufacturing of Long-Length High Performance HTS Tapes*" at the UH Manufacturing Day held at University of Houston, SugarLand, TX, USA. **Oct. 20, 2023**
- Attended and presented the poster, "*Manufacturing Scale-up of High Performance REBCO Superconductor Tapes*" at the UH Energy Research Day, University of Houston, TX, USA. **Aug. 30, 2023**
- Attended and presented the poster, "*Superior critical current of long length 4 μm thick REBCO tapes*", International Workshop on Coated Conductors for applications, University of Houston, TX, USA. **Apr. 3-6, 2023**
- Attended and presented, "*Development of long-length REBCO tapes by A-MOCVD*", 18th TcSUH Student/Postdoc Seminar, University of Houston, TX, USA. **Mar. 27, 2023**
- Attended and presented the paper, "*Development of 50-meter RE-Ba-Cu-O tapes with critical current over 1750 A/12mm at 65 K, 0.25 T by Advanced-MOCVD*", Applied Superconductivity Conference, Honolulu, USA. **Oct. 23-28, 2022**

Achievements & Awards

- Selected to participate in the ARPA-E Energy Innovation Summit, one of only 100 students nationwide **Jan 2025**
- Featured in the Student spotlight at IEEE CSC website. (<https://ieeecsc.org/post/student-spotlight>) **Jan 2025**
- Awarded American Society of Indian Engineers and Architects (ASIE) 2024 Scholarship; Texas wide (\$3000 award) **Nov 2024**
- Pitch the idea of the Start Up "AmpsUP" as a team of three and earned special recognition as finalists (one of only five University wide) at the Third Annual Energy Innovation Commercialization Competition, University of Houston **Sep 2024**
- Honored to be featured in the UH national commercial celebrating superconductivity research, University of Houston **Sep 2024**

- Selected as a recipient of 2024 Mechanical Engineering Department Scholarship Award for outstanding Ph.D. students (\$1000 award), University of Houston **2024- 2025**
- Awarded TcSUH Cora Hawley Scholarship; one of only six University wide (\$1,500 award) **2024-2025**
- UH Chevron Graduate Energy Fellow; one of only eight University wide (\$12,000 award) **2023-2024**
- Served on the student board of Applied Superconductivity Conference- ASC 2024 Program Committee meeting; one of only six in superconductivity field held in Salt Lake City, Utah **Feb 2024**
- Contributed to the "Super Cool Conductor" team for the CABLE Conductor Manufacturing Prize Competition, awarded a \$200,000 cash prize by the U.S. Department of Energy. **2023- 2024**
- Doctoral Scholarship Tuition Fellowship recipient for 3+ years of graduate school, Uni. of Houston. **Aug 2021-till date**
- Won second prize with \$500 cash prize in the Poster Competition at the International Workshop on Coated Conductors for applications, University of Houston, TX, USA. **Apr. 2023**
- Awarded Engineering Dean's Master Scholarship of Cullen College of Engineering for two years, Uni. of Houston **2018-2020**
- Awarded performance top band "A" in three consecutive appraisal cycles held annually in TCS, India. **2015-2018**
- First rank in VIII Semester of Mechanical Engineering at D.C.R. University of Science and Technology, India. **2014**
- Secured fourth rank in Mechanical Engineering (2010-2014) batch of DCRUST University, India.
- Received a Merit Scholarship each semester during Mechanical Engineering program of University, Haryana, India. **2011-2014**
- Won third prize and a cash award of INR 30,000 in a team of two in National Engineering Quiz Contest organized by Indian Society of Heating, Refrigerating and Air-Conditioning Engineers (ISHRAE), Delhi, India. **Feb2014**
- Secured third prize in technical paper presentation in TECHNOVA-2014 at DCRUST University, India. **Feb 2014**
- Ranked top 2% out of over 1.4 million students appearing in All India Egg. Entrance Exam (AIEEE), India. **May 2009**

Extra Curricular Activities and Volunteer Work

- Contributing Writer of the "Superconductor Week" monthly Newsletter published by TcSUH, University of Houston, TX, USA. **June 2024-present**
- Committee Member of the IEEE CSC Young Professional **Jan 2024-present**
- Student Member of ASM International, Member#589237 **Jan2025-present**
- Student member of the TiE Houston **Jan 2024-present**
- Member of the ELEVATE Student Program Committee for ASC 2024 **Jan 2024- Dec 2024**
- IEEE Graduate Student Member, Member #97603374 **Jan 2024-Dec 2024**
- Actively participated as a student volunteer in workshops organized by TcSUH to demonstrate science experiments for middle and high school students, Uni. of Houston **2023 - 2024**
- Student member of the American Society of Indian Engineers and Architects (ASIE) **Jan 2023-Dec 2024**
- Participated in the Mentorship Program as a Mentee by ASIE **May 2024- Sep 2024**
- Student Volunteer- Int. workshop on coated conductors and appl. held at UH **Apr 2023**
- Student Member- UH Materials Research Society Student Chapter and ASME **2018-2020**
- Founder and President Elect of Students Chapter of Indian Society of Heating, Refrigerating and Air conditioning Engineers (ISHRAE), Department of Mechanical Engineering, DCRUST Murthal, India **Apr 2013-14**