Vivek Devulapalli, Ph.D.

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Professional summary

I am an early-career postdoctoral researcher specializing in advanced electron microscopy with a materials science background. I employ aberration-corrected STEM to link atomic structure and composition to material properties across multiple length scales. My expertise includes multidimensional imaging, analytical techniques, STEM simulations, in-situ nanomechanics, and correlative approaches for comprehensive material characterization.
My PhD work on grain boundary engineering in titanium, including the discovery of segregation-induced phase transitions, culminated in a Science publication (2024). As a postdoc at MPIE, I expanded into hydrogen embrittlement mechanisms in particle-reinforced high-entropy alloys, combining advanced characterization with mechanical testing. Currently at EMPA, I employ in-situ S/TEM techniques to investigate deformation mechanisms across diverse material systems, from single crystals to complex multilayered architectures, including nanolaminates and thin films. Beyond research, I am committed to teaching and mentoring, open science practices, and active science communication through interactive web-based tools and educational materials.

Scientific career

2024 – Present
Postdoctoral researcher, EMPA, Thun, Switzerland
Project: *In-situ TEM tensile testing of crystalline-amorphous nanolayered materials*
SNSF Ambizione proposal: *In situ nanomechanics and phase transformations at interfaces (INSPIRE)*
Innosuisse Project: *Quantized nanolaminates as industrial magnetron sputtering process*
PI: *Prof. Johann Michler, Dr. Xavier Maeder*

2022 – 2024
Postdoctoral researcher, Max-Planck Institut für Eisenforschung, Düsseldorf, Germany
DFG Project: *Mechanical properties and hydrogen tolerance of particle-reinforced CCA produced by additive manufacturing*
PI: *Prof. Gerhard Dehm, Prof. Eric Jägle*

2018 – 2022
PhD, Max-Planck Institut für Eisenforschung, Düsseldorf, Germany
Advanced transmission electron microscopy group, Department of structure and nano-/ micromechanics of materials
Thesis title: *Microstructure and grain boundary evolution in titanium thin films.*
Supervisor: *Prof. Gerhard Dehm*, Group leader: *Dr. Christian Liebscher*

2016 – 2018
M.Tech., Indian Institute of Technology, Madras, India
Metallurgical and materials engineering department
Thesis title: *Correlative microscopy of Magnesium - rare-earth alloys.*
Thesis work performed as a **DAAD exchange program at Materials Chemistry, RWTH Aachen, Germany** with *Prof. Jochen Schneider*
Supervisors: *Prof. B S Murty, Prof. K G Pradeep*

2012 – 2016
B.Tech., National Institute of Technology, Raipur, India in Metallurgical engineering
CGPA: 9.22/10 (Honours)

Research Publications

First Author Publications

1 **Devulapalli, V.**, Klimashin, F. F., Baertschi, M., Waldner, S., Schwyn Thoeny, S., Michler, J., & Maeder, X. (2026). Interface-mediated softening and deformation mechanics in amorphous/amorphous nanolaminates. *Scripta Materialia*, *255*, 117118. https://doi.org/10.1016/j.scriptamat.2025.117118

2. **Devulapalli, V.**, Prabhakar, M., Schulz, F., Maeder, X., Jaegle, E. A., Duarte, J., & Dehm, G. (2025). Hydrogen induced softening and deformation mechanisms in nanoparticle reinforced CoCrFeNi [Manuscript prepared (waiting for co-author approval)].

3. **Devulapalli, V.**, Vermeij, T., Sharma, A., Michler, J., & Maeder, X. (2025). Enhanced toughness in cu–al nanolaminate films with amorphous al_2o_3 interlayers: Insights from in situ tem tensile testing [Manuscript in preparation]. https://doi.org/10.5281/zenodo.17523627

4. **Devulapalli, V.**, Schulz, F., Barreto, E. S., Ellendt, N., Jaegle, E. A., & Dehm, G. (2024). Laser powder bed fusion synthesis of nanoparticle reinforced cocrfeni. *Additive Manufacturing*, *91*, 104338. https://doi.org/10.1016/j.addma.2024.104338

5. **Devulapalli, V.**, Chen, E., Brink, T., Frolov, T., & Liebscher, C. (2024). Segregation induced grain boundary phase transition in titanium. *Science*, *386*, 420–424. https://doi.org/10.1126/science.adq4147

6. **Devulapalli, V.**, Hans, M., Sukumar, P. T., Schneider, J. M., Dehm, G., & Liebscher, C. (2022). Microstructure, grain boundary evolution and anisotropic fe segregation in (0001) textured ti thin films. *Acta Materialia*, *238*, 118180. https://doi.org/10.1016/j.actamat.2022.118180

7. **Devulapalli, V.**, Bishara, H., Ghidelli, M., Dehm, G., & Liebscher, C. (2021). Influence of substrates and e-beam evaporation parameters on the microstructure of nanocrystalline and epitaxially grown ti thin films. *Applied Surface Science*, *562*, 150194. https://doi.org/10.1016/j.apsusc.2021.150194

Co-authored Publications

1. Sahu, S., **Devulapalli, V.**, Saood, S., Dehm, G., & Best, J. P. (2026). Impact of focused ion beam-induced damage on micromechanical properties in hematite. *Scripta Materialia*, *257*, 117000. https://doi.org/10.1016/j.scriptamat.2025.117000

2. Lyrio, M., Oliveira, H., Sandim, M., **Devulapalli, V.**, & Sandim, H. (2025). Effect of the scanning strategy on texture of grain-oriented electrical steel (fe-4wt.% si) processed via laser powder-bed fusion and subsequent thermomechanical processing. *Materials Characterization*, *221*, 114789. https://doi.org/10.1016/j.matchar.2025.114789

3. Chatzopoulou, P., Hilliard, D., Vasileiadis, I. G., Florini, N., **Devulapalli, V.**, Liebscher, C. H., Lymperakis, L., Komninou, P., Kehagias, T., & Dimakis, E. (2025). Elastic limit and relaxation of gaas/in(al,ga)as core/shell nanowires for near-infrared applications [Focus on Nanowires 2023-24]. *Nanotechnology*, *36*(9), 095703. https://doi.org/10.1088/1361-6528/ad9d4a

4. Baertschi, M., Waldner, S., Schwyn Thoeny, S., Maeder, X., Steger, F., Frei, T., & **Devulapalli, V.** (2025). Uv coatings using ta2o5-sio2 quantized nanolaminates. *Journal of the European Optical Society-Rapid Publications*, *21*(1), 24. https://doi.org/10.1051/jeos/2025021

5. Byloff, J., **Devulapalli, V.**, Casari, D., Edwards, T. E. J., Trost, C. O. W., Cordill, M. J., Husain, S. A., Renault, P.-O., Faurie, D., & Putz, B. (2025). From mechanics to electronics: Influence of ald interlayers on the multiaxial electro-mechanical behavior of metal-oxide bilayers. *Advanced Functional Materials*. https://doi.org/10.1002/adfm.202526343

6. Byloff, J., Trost, C. O. W., **Devulapalli, V.**, Altaf Husain, S., Faurie, D., Renault, P.-O., Edwards, T. E. J., Cordill, M. J., Casari, D., & Putz, B. (2025). Atomic layer-deposited interlayers for robust metal–polymer interfaces. *ACS Applied Materials & Interfaces*. https://doi.org/10.1021/acsami.5c05156

7. Senol, S., Li, G., **Devulapalli, V.**, Brodu, E., & Vanmeensel, K. (2024). High strength and fatigue performance achieved for l-pbf processed hybrid particle reinforced al-cu-mg composite. *Composites Part B: Engineering*, *285*, 111736. https://doi.org/10.1016/j.compositesb.2024.111736

8. Dhekne, P. P., Vermeij, T., **Devulapalli, V.**, Jadhav, S. D., Hoefnagels, J. P., Geers, M. G., & Vanmeensel, K. (2023). Micro-mechanical deformation behavior of heat-treated laser powder bed fusion processed ti-6al-4v. *Scripta Materialia*, *233*, 115505. https://doi.org/10.1016/j.scriptamat.2023.115505

9. Gaertner, E., Witte, A., Peter, N. J., **Devulapalli, V.**, Ellendt, N., Dehm, G., Jaegle, E. A., Uhlenwinkel, V., & Maedler, L. (2023). Melt pool signatures of tin nanoparticle dry-coated $Co_{25}Cr_{25}Fe_{25}Ni_{25}$ metal powder in laser-powder-bed-fusion. *Materials & Design*, *226*, 111626. https://doi.org/10.1016/j.matdes.2023.111626

10 Kiani, M. T., Savan, A., Pflitsch, C., Parsa, A. B., Naghizadeh, M., Esmaily, M., Ahl, S., Dehghan-Manshadi, A., **Devulapalli, V.**, Wang, D., Griffiths, J., Haase, C., Simon, U., Schneider, J. M., Birbilis, N., Ludwig, A., & Dehm, G. (2021). Symbiotic crystal-glass alloys via dynamic chemical partitioning. *Materials Today*, *51*, 69–77.
https://doi.org/10.1016/j.mattod.2021.10.025

11 Vasileiadis, I. G., Lymperakis, L., Adikimenakis, A., Gkotinakos, A., **Devulapalli, V.**, Liebscher, C. H., Androulidaki, M., Huebner, R., Karakostas, T., Georgakilas, A., Komninou, P., Dimakis, E., & Dimitrakopulos, G. P. (2021). Substitutional synthesis of sub-nanometer InGaN/GaN quantum wells with high indium content. *Scientific Reports*, *11*(1), 20606.
https://doi.org/10.1038/s41598-021-99989-0

Skills

Instruments with 7+ years of hands-on experience
- Thin film deposition, Material characterization on all length scales - XRD, SEM, EDS, EBSD, FIB, TEM, Multi-dimensional STEM techniques (EELS, ACOM, 4DSTEM), APT.

Programming and softwares
- Python - multidimensional microscopy data analysis and image processing (py4Dstem, hyperspy), image simulation (abTEM, prismatic), image processing (numpy, sckitimage), data vizualization (mpl), LaTeX, Crystallographic analysis (MTEX), Ovito, Inkscape, Adobe Premier pro .

Conferences

Talk
- TMS Annual Meeting & Exhibition, San Diego, CA, USA (March 2026)
  Interface-Mediated Deformation Transition and Quantum Confinement Effects in Ta_2O_5/SiO_2 Optical Nanolaminates.
  Session: Interface-Driven Plasticity and Fracture in Nanostructured and Layered Materials.
- TMS Annual Meeting & Exhibition, San Diego, CA, USA (March 2026)
  Hydrogen-Enhanced Localized Plasticity in Nanoparticle-Reinforced CoCrFeNi Medium-Entropy Alloys.
  Session: Alloy Synthesis and Processing.
- TMS Annual Meeting & Exhibition, San Diego, CA, USA (March 2026)
  In-Situ TEM Investigation of Fracture Growth in Novel Nanolaminate Thin Films.
  Session: Advanced Characterization Techniques for Quantifying and Modeling Deformation - Electron Microscopy.
- EMPA Department 020 Kick-off Meeting (January 2026)
  In-Situ Nanomechanics and Electron Diffraction in TEM: Revealing Deformation Mechanisms in Nanolaminate Structures.
- In situ Electron Microscopy Workshop, Toulouse, France (January 2026)
  Advanced in situ TEM techniques for nanomaterial characterization.
- EMPA Board of Governors Department 206 Meeting (September 2025)
  Probing deformation mechanics at micro-/nanoscale.
- FEMS-Euromat, Granada, Spain (2025)
  Hydrogen induced softening and deformation mechanisms in nanoparticle reinforced CoCrFeNi.
- FEMS-Euromat, Granada, Spain (2025)
  In situ TEM investigation of fracture growth in novel nanolaminate thin films.
- MecaNano - General meeting, Krakow, Poland (2025)
  Fracture behaviour in Cu-Al multilayer thin films with amorphous AlO interlayers: Insights from in-situ TEM tensile testing.
- International Conference on Correlative Electron Microscopy, Brno, Czech Republic (2025)
  Enhancing Thin Film Toughness: The Role of Amorphous Interlayers.
- FEMS - Euromat, Frankfurt, Germany (2023)
  Additively manufactured particle reinforced-CoCrFeNi: Microstructure, mechanical behaviour and hydrogen response.

Conferences (continued)

- MSE Darmdtadt (Virtual), Darmstadt, Germany (2020)
  Unravelling grain boundary structures in Ti thin films using aberration-corrected transmission electron microscopy.

Poster

- International Microscopy Conference (IMC20), South-Korea (2023)
  Experimental observation of segregation induced grain boundary phase transition in titanium
- Microscopy Conference 2021, Vienna, Austria (Virtual) (2021)
  Unravelling the atomic structure and segregation of $\Sigma 13$ [0001] tilt grain boundaries in titanium by advanced STEM.
- IAMNano, Düsseldorf, Germany (2019)
  From epitaxially grown thin films to grain boundary analysis in Cu and Ti.

Positions of Responsibility

Supervision and teaching experience

1. Guest lecturer for Master's students at University of Bern in Precision Engineering: Delivered 3 lectures on "Advances in Transmission Electron Microscopy", 2024-2025.
2. Supervised a Cambridge University summer intern for 8 weeks, 2023.
3. Peer-reviewed a full-length journal article for *Materialia*, 2023.
4. Delivered a lecture on 'grain boundaries' as part of a seminar series at MPIE, 2021.
5. Served as a teaching assistant under Prof. Ravi Shankar Kottada, IIT - Madras, 2016.

Leadership & Organization

1. Member of European Microscopy Society (EMS) and Deutsche Gesellschaft für Elektronenmikroskopie e.V. (DGE), 2019-present.
2. Internal PhD representative, 2019-2022.
3. Member of MPIE's sustainability team, 2021-2023.
4. Organized and participated in a teaching seminars and career planning seminar, 2021-2022.
5. Managed MPIE's Twitter account, 2020-2023.
6. Coordinated department weekly-seminars, 2022-23.
7. Managed a high-vacuum furnace, 2021-2023.

Science communication

1. Actively developing open-source educational resources including interactive web-based tools for materials science concepts and Jupyter notebooks for electron microscopy data analysis, available on GitHub and personal website. `https://vivekdevulapalli07.github.io/website/` `https://github.com/vivekdevulapalli07`
2. Represented MPIE at the Bright World of Metals science slam event, 2023.
3. Organized and spoke at "Pint of Science," Düsseldorf, 2021 and 2023.
4. Represented MPIE at "Nacht-der-Wissenschaft (Science Night)," Düsseldorf, 2022.
5. Attended the **Alexander-von-Humboldt scholarship-funded** Science Communication Summer School in Berlin, 2021, resulting in a published *Declaration on the Future of Science Communication* presented to the German Parliament.
6. Editorial team member for the Max-Planck PhD-net scientific magazine, "Offspring," 2019-2020.

Awards and recognition

- Granted travel support by MecaNano cost action to give talk at Euromat 2025.
- Granted travel support by MecaNano cost action to give talk at MecaNano - General meeting, 2025.

- Granted travel support by European Microscopy Society for MC-2021, Vienna.
- **DAAD IIT-Masters scholarship** for a 7 month research stay in RWTH-Aachen, Germany, 2017.
- Scored **All India Rank – 76** in Graduate Aptitude Test in Engineering in Material Science, 2016.
- Scored **All India Rank - 4** in Metallurgical Thermodynamics exam conducted by NPTEL, 2016.
- Secured ARCI Hyderabad summer internship through first-place presentation at IIT - BHU, 2015.
- Awarded as **Eminent student of the branch** by Humanities department, NIT – Raipur, 2015.

References

Prof. Dr. Gerhard Dehm
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Prof. Dr. Christian Liebscher
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Ruhr University Bochum
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Prof. Dr. Johann Michler
Adjunct Professor, EPFL
Head of laboratory, Laboratory for Mechanics of Materials and Nanostructures,
EMPA, Thun
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