G. Jeffrey Snyder

	G. Jeifrey Snyder	STERNUS
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EDUCATION	Stanford University, Applied Physics, Stanford CA	Ph. D. 1997
	Fanny and John Hertz Fellow	M. S. 1994
	Cornell University, Ithaca NY	B.A. 1991
	Magna Cum Laude Chemistry	
	Magna Cum Laude Physics	
	Cum Laude Mathematics	
EXPERIENCE	Northwestern University	2015-present
	Professor of Materials Science and Engineering	
	California Institute of Technology Faculty Associate in Materials Science	2006-2014
	California Polytechnic University, Pomona CA Adjunct Professor and Lecturer in Chemical and Materials Science	2005-9
	Jet Propulsion Laboratory, California Institute of Technology Senior Member of Technical Staff	1997-2006
	Department of Applied Physics, Stanford U., Stanford, CA Fanny and John Hertz Fellow	1991-1997
	Max-Planck-Institut für Festkörperforschung, Stuttgart, German Visiting Scholar	y 1992-1993
ACTIVITIES	Highly Cited Researcher (Web of Science)	2016-23
	Instructor at schools on energy materials (Africa, Asia, Europe, USA) 2008-20
	Conference organizer, and Journal advisory board member	
	International Thermoelectric Society. Treasurer, board of directors	2007-14
	Outstanding achievement award	2023
	International Thermoelectric Academy. Elected as vice president	2013

RESEARCH TOPICS



Thermoreflectance image showing thermal interface resistance depending on grain boundary misorientation



Electron density map used to locate Zn interstitials in Zn₄Sb₃

- **Thermal and Electrical Transport at Interfaces.** Characterization and analysis of electrical and thermal interface resistance in semiconductors. Grain boundary complexion engineering for high thermoelectric performance (e.g. Mg₃Sb₂ or Half Heuslers) or thermal management (Si based electronics)
- **Defect Engineering and Thermodynamics**. Developed *phase boundary mapping* to rationally engineer charged defect energies in semiconductors. Use of DFT-based calculations for accurate thermodynamic predictions.
- **Band Structure Engineering of Thermoelectric Materials.** Use of alloying to control band convergence for high valley degeneracy. Demonstration of high zT in several PbTe, PbSe n-type and p-type systems ideal for waste heat recovery.
- **Zintl Materials for Thermoelectric power generation.** Spearheaded exploration of Zintl phases for thermoelectric applications. Demonstrated high efficiency in Mg₃Sb₂ and Yb₁₄MnSb₁₁ and electronic tunability in Zintl phases.
- **Solid-State Physics and Thermodynamics of Thermoelectric Materials** Predictive modeling of electronic and thermal transport properties of heavily doped semiconductors based on weighted mobility and quality factor.

Thermoelectric Engineering. Hierarchical engineering principles for design of thermal to electric power generation and thermal management systems based on *thermoelectric compatibility*.

Selected Publications

Full list of publications available at thermoelectrics.matsci.northwestern.edu and GoogleScholar

- 1. E. Isotta *et al.*, "Microscale Imaging of Thermal Conductivity Suppression at Grain Boundaries" *Advanced Materials*, 2302777 (2023)
- 2. G. J. Snyder et al., "Weighted Mobility" Advanced Materials, 2001537 (2020)
- 3. G. J. Snyder, E. S. Toberer "Complex thermoelectric materials" Nature Mater., 7, 105 (2008).
- 4. R. Gurunathan, R. Hanus, and G. J. Snyder, "Alloy scattering of phonons" Materials Horizons (2020)
- 5. S. I. Kim, H. S. Kim, Snyder, S. W. Kim, *et al.* "Dense dislocation arrays embedded in grain boundaries for high-performance bulk thermoelectrics" *Science*, 348, 6230 (2015)
- 6. Y. Pei, H. Wang and G. J. Snyder "Band Engineering of Thermoelectric Materials" Adv. Mat. 24, 6125 (2012)
- 7. Riley Hanus, et al, "Thermal transport in defective and disordered materials" Appl. Phys. Rev. 8, 031311 (2021)
- 8. S. Ohno et al., "Phase Boundary Mapping to Obtain n-type Mg₃Sb₂-Based Thermoelectrics" Joule **2**, 141 (2018)
- 9. E. S. Toberer, A. F. May and G. J. Snyder "Zintl Chemistry for Designing High Efficiency Thermoelectric Materials" *Chemistry of Materials*, **22**, 624 (2010)
- 10. Jimmy J. Kuo *et al.*, "Grain boundary dominated charge transport in Mg3Sb2-based compounds" *Energy & Environmental Science* **11**, 429 (2018)
- 11. Yanzhong Pei, Xiaoya Shi, Aaron LaLonde, Heng Wang, Lidong Chen and G. Jeffrey Snyder "Convergence of Electronic Bands for High Performance Bulk Thermoelectrics" *Nature* **473**, 66 (2011)
- 12. Stephen Kang, G. J. Snyder "Charge Transport Model for Conducting Polymers" Nature Materials 16, 252 (2017)