Curriculum Vitae for Robert S. Hoy

Contact Info

University of South Florida
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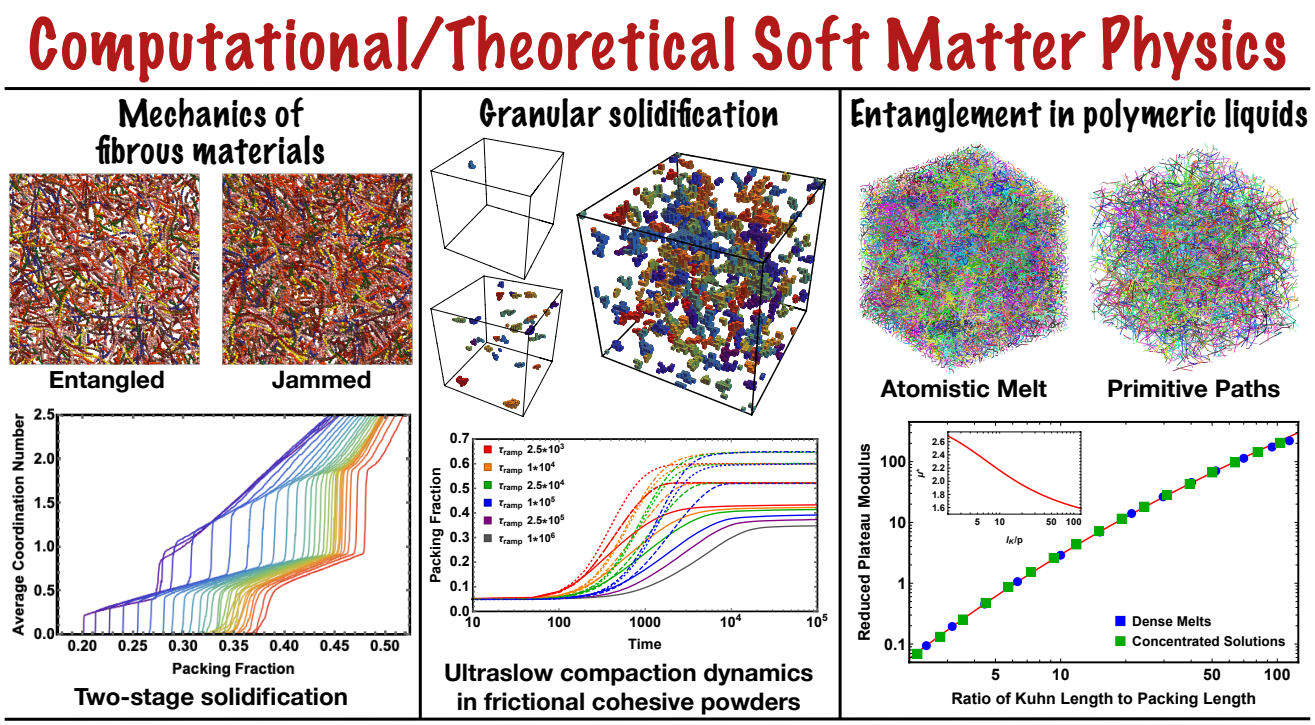
Research Focus: Soft Matter Theory

Many mechanical, dynamical and structural properties of materials remain poorly understood for reasons that are independent of system-specific chemistry. Great advances in understanding these properties can be achieved through coarse-grained and multiscale simulations that are computationally efficient enough to access experimentally relevant spatiotemporal scales, but "chemically realistic" enough to capture the essential physics underlying the properties under study. My research aims to explain poorly-understood behaviors of polymeric, glassy, and granular systems through coarse-grained modeling and concomitant development of analytic theories. Generally I aim to do basic research on topics that are of susbtantial practical interest.



Research and Teaching Appointments

2024-Present: Program Director, Condensed Matter & Materials Theory (DMR-CMMT), National Science Foundation
2019-Present: Associate Professor of Physics, University of South Florida
2012-19: Assistant Professor of Physics, University of South Florida
2010–2012: Associate Research Scientist, Department of Mechanical Engineering & Materials Science, Yale University
2009-10: Anderson Postdoctoral Fellow, Department of Mechanical Engineering & Materials Science, Yale University
2007–2009: Postdoctoral Fellow, Materials Research Laboratory, UC Santa Barbara

Education

B.A. in Physics, 1999; Ph.D. in Physics, 2008
Johns Hopkins University

Grants Awarded

Intergovernmental Personnel Act (IPA) Mobility Assignment: NSF Division of Materials Research Award No. DMR-2419261, 2/12/2024-12/12/2025, total award $322,859.

Stress Testing Theories of the Glass and Jamming Transitions Using Hyperellipsoids: NSF Division of Materials Research Award No. DMR-2026271, 3/1/2021-2/29/2025, total award $315,000.

CAREER: Fundamental Studies of Glassy Polymer Mechanics: NSF Division of Materials Research Award No. DMR-1555242, 4/1/2016-3/31/2022; total award $490,000.

Modeling the Mechanochemistry of Amorphous and Semicrystalline Polymers: Army Research Office, 8/1/2014-8/31/2015: total award $28,270.

Mesoscale Modeling of Mechanical Properties for Amorphous Polymers: Army Research Office, 8/30/2011-2/27/2013: total award $101,695.

Recent Professional Service

Topic Editor for *Polymers*, 2020-23

APS Bridge to the Doctorate Program (USF Site): Committee Member 2013-20, Site Leader 2019-20

Referee for NSF proposals (DMR-CMMT, ENG-CMMI and CISE) and numerous journals including *Physical Review Letters*, *Physical Review E*, *Soft Matter*, *Macromolecules*, and *Journal of Chemical Physics*

Awards and Honors

Jewell Award for Faculty Excellence (USF Dept. of Physics), 2021

Outstanding Undergraduate Research Adviser (USF Dept. of Physics), 2019

USF Outstanding Faculty Award, 2017

Peer Reviewed Publications

Total citations: 1996 (2431) h-index: 24 (27) Source: Web of Science (Google Scholar), 1/16/25

55. Generating ultradense jammed ellipse packings using biased SWAP
R. S. Hoy: *Journal of Physical Chemistry B* **129**, 763 (2025)

54. Critical-like slowdown in thermal soft-sphere glasses via energy minimization
K. A. Interiano-Alberto, P. K. Morse and R. S. Hoy: *Physical Review E* **109**, L062603 (2024)

53. Homogeneous crystallization in four-dimensional Lennard-Jones liquids
R. S. Hoy: *Physical Review E* **109**, 044604 (2024)

52. Craze extension ratio of semiflexible polymer glasses
K. Nan and R. S. Hoy: *Macromolecules* **56**, 8369 (2023)

51. Structure of jammed ellipse packings with a wide range of aspect ratios
S. Rocks and R. S. Hoy: *Soft Matter* **19**, 5701 (2023)

50. Ultraslow settling kinetics of frictional cohesive powders
K. Nan and R. S. Hoy: *Physical Review Letters* **130**, 166102 (2023)

49. Structure of saturated random-sequential-adsorption ellipse packings
P. Abritta and R. S. Hoy: *Physical Review E* **106**, 054604 (2022)

48. The Z1+ package: Shortest multiple disconnected path for the analysis of entanglements in macromolecular systems
M. Kröger, J. D. Dietz, R. S. Hoy and C. Luap: *Computer Physics Communications* **283**, 108567 (2022)

47. Unexpected ductility in semiflexible polymer glasses with entanglement length equal to their Kuhn length
J. D. Dietz, K. Nan and R. S. Hoy: *Physical Review Letters* **129**, 127801 (2022)

46. Efficient d-dimensional molecular dynamics simulations for studies of the glass-jamming transition
R. S. Hoy and K. A. Interiano-Alberto: *Physical Review E* **105**, 055305 (2022)

45. Validation and refinement of unified analytic model for flexible and semiflexible polymer melt entanglement
J. D. Dietz, M. Kröger and R. S. Hoy: *Macromolecules* **55**, 3613 (2022)

44. Facile equilibration of well-entangled semiflexible bead–spring polymer melts
J. D. Dietz and R. S. Hoy: *Journal of Chemical Physics* **156**, 014102 (2022)

43. How does the character of glassy-polymeric cavitation depend on entanglement density and the local Poisson ratio?
K. Nan, P. Abritta and R. S. Hoy: *Macromolecules* **54**, 7347 (2021)

42. Thermodynamic stability of hard sphere crystals in dimensions 3 through 10
P. Charbonneau, C. M. Gish, R. S. Hoy and P. K. Morse: *European Physical Journal E* **44**, 101 (2021)

41. Does the Sastry transition control cavitation in simple liquids?
C. M. Gish, K. Nan and R. S. Hoy: *Journal of Chemical Physics* **153**, 184504 (2020)

40. Two-stage athermal solidification of semiflexible polymers and fibers
J. D. Dietz and R. S. Hoy: *Soft Matter* **16**, 6206 (2020)

39. Unified analytic expressions for the entanglement length, tube diameter, and plateau modulus of polymer melts
R. S. Hoy and M. Kröger: *Physical Review Letters* **124**, 147801 (2020)

38. Multiscale modeling of sub-entanglement-scale chain stretching and strain hardening in deformed polymeric glasses
W. Zou, S. Moghadam, R. S. Hoy and R. G. Larson: *Macromolecules* **52**, 9248 (2019)

37. Factors influencing thermal solidification of bent-core trimers
E. D. Salcedo, H. T. Nguyen and R. S. Hoy: *Journal of Chemical Physics* **151**, 134501 (2019)

36. Densest versus jammed packings of bent-core trimers
A. D. Griffith and R. S. Hoy: *Physical Review E* **100**, 022903 (2019)

35. Thermalization of plastic flow versus stationarity of thermomechanical equilibrium in SGR theory
R. S. Hoy: *European Physical Journal E* **42**, 2 (2019)

34. Densest versus jammed packings of two-dimensional bent-core trimers
A. D. Griffith and R. S. Hoy: *Physical Review E* **98**, 042910 (2018)

33. Effect of the ratio ℓ_K/p on glassy-polymeric shear deformation mechanisms
H. T. Nguyen and R. S. Hoy: *Macromolecules* **51**, 4370 (2018)

32. From sticky-hard-sphere to Lennard-Jones-type clusters
L. Trombach, R. S. Hoy, D. J. Wales and P. Schwerdtfeger: *Physical Review E*, **97**, 044309 (2018)

31. Thermalized formulation of soft glassy rheology
R. S. Hoy: *Physical Review E* **96**, 063001 (2017)

30. Isostaticity and the solidification of semiflexible polymer melts
C. Plaza-Rivera, H. T. Nguyen and R. S. Hoy: *Soft Matter* **13**, 7948 (2017)

29. Jamming of semiflexible polymers
R. S. Hoy: *Physical Review Letters* **118**, 069002 (2017)

28. Entanglements in glassy polymer crazing: cross-links or tubes?
T. Ge, C. Tzoumanekas, S. Anogiannakis, R. S. Hoy and M. O. Robbins: *Macromolecules* **50**, 459 (2017)

27. Effect of chain stiffness and temperature on the dynamics and microstructure of crystallizable bead-spring polymer melts: H. T. Nguyen and R. S. Hoy: *Physical Review E* **94**, 052502 (2016)

26. Controlled fragmentation of multimaterial fibres and films via polymer cold-drawing
S. Shabahang, G. Tao, J. J. Kaufman, Y. Qiao, L. Wei. T. Bouchenot, A. P. Gordon, Y. Fink, Y. Bai, R. S. Hoy, and A. F. Abouraddy: *Nature* **534**, 529 (2016)

25. Effect of chain stiffness on the competition between crystallization and glass-formation in model unentangled polymers
H. T. Nguyen, T. B. Smith, R. S. Hoy, and N. C. Karayiannis: *Journal of Chemical Physics* **143**, 144901 (2015)

24. Effect of temperature, strain rate and particle size on the yield stresses and post-yield strain softening of PMMA and its composites: J. Jancar, R. S. Hoy, E. Jancarova, and J. Zidek: *Polymer* **63**, 196 (2015)

23. Structure and dynamics of model colloidal clusters with short-range attractions
R. S. Hoy: *Physical Review E* **91**, 012303 (2015)

22. Role of entanglements and bond dcission in high strain-rate Deformation of Polymer Gels
Y. R. Sliozberg, R. S. Hoy, R. A. Mrozek, J. L. Lenhardt and J. W. Andzelm: *Polymer* **55**, 2543 (2014)

21. Effect of particle size, temperature, and deformation rate on the plastic flow and strain hardening response of PMMA composites
J. Jancar, R. S. Hoy, A. J. Lesser, E. Jancarova and J. Zidek: *Macromolecules* **46**, 9409 (2013)

20. Particle-scale reversibility in athermal particulate media below jamming
C. F. Schreck, R. S. Hoy, M. D. Shattuck and C. S. O'Hern: *Physical Review E* **88**, 052205 (2013)

19. Nonlinear mechanics of thermoreversibly associating dendrimer glasses
A. Srikanth, R. S. Hoy, B. C. Rinderspacher and J. W. Andzelm: *Physical Review E* **88**, 042607 (2013)

18. Simple model for chain packing and crystallization of soft colloidal polymers
R. S. Hoy and N. C. Karayiannis: *Physical Review E* **88**, 012601 (2013)

17. Minimal energy packings of nearly flexible polymers
R. S. Hoy, J. Harwayne-Gidansky and C. S. O'Hern: *Journal of Chemical Physics* **138**, 054905 (2013)

16. Structure of finite sphere packings via exact enumeration: implications for colloidal crystal nucleation
R. S. Hoy, J. Harwayne-Gidansky and C. S. O'Hern: *Physical Review E* **85**, 051403 (2012)

15. Glassy dynamics of crystallite formation: the role of covalent bonds
R. S. Hoy and C. S. O'Hern: *Soft Matter* **8**, 1215 (2012)

14. Why is understanding glassy polymer mechanics so difficult?
R. S. Hoy: *J. Polym. Sci. Part B: Polym. Phys.* **49**, 979 (2011)

13. End grafted polymer nanoparticles in a polymeric matrix: effect of coverage and curvature
J. Kalb, D. Dukes, S. K. Kumar, R. S. Hoy and G. S. Grest: *Soft Matter* **7**, 1418 (2011)

12. Viscoplasticity and large-scale chain relaxation in glassy-polymeric strain hardening
R. S. Hoy and C. S. O'Hern: *Physical Review E* **82**, 041803 (2010)

11. Minimal energy packings and collapse of sticky tangent hard-sphere polymers
R. S. Hoy and C. S. O'Hern: *Physical Review Letters* **105**, 068001 (2010)

10. Strain hardening in bidisperse polymer glasses: separating the roles of chain orientation and interchain entanglement: R. S. Hoy and M. O. Robbins: *Journal of Chemical Physics* **131**, 244901 (2009)

9. Thermoreversible associating polymer networks: I. Interplay of thermodynamics, chemical kinetics, and polymer physics: R. S. Hoy and G. H. Fredrickson: *Journal of Chemical Physics* **131**, 224902 (2009)

8. Topological analysis of polymeric melts: chain length effects and fast-converging estimators for entanglement length R. S. Hoy, K. Foteinopoulou and M. Kröger: *Physical Review E* **80**, 031803 (2009)

7. Scaling of the strain hardening modulus of glassy polymers with the flow stress M. O. Robbins and R. S. Hoy: *J. Polym. Sci. Part B: Polym. Phys.* **47**, 1406 (2009)

6. Strain hardening of polymer glasses: entanglements, energetics and plasticity R. S. Hoy and M. O. Robbins: *Physical Review E* **77**, 031801 (2008)

5. Entanglements of an end-grafted polymer brush in a polymeric matrix R. S. Hoy and G. S. Grest: *Macromolecules* **40**, 8389 (2007)

4. Strain hardening in polymer glasses: limitations of network models R. S. Hoy and M. O. Robbins: *Phys. Rev. Lett.* **99**, 117801 (2007)

3. Strain hardening of polymer glasses: effect of entanglement density, temperature and rate R. S. Hoy and M. O. Robbins: *J. Polym. Sci. Part B: Polym. Phys.* **44**, 3487 (2006)

2. Effect of equilibration on primitive path analyses of entangled polymers R. S. Hoy and M. O. Robbins: *Physical Review E* **72**, 061802 (2005)

1. Fcc-bcc transition for Yukawa interactions determined by applied strain deformation R. S. Hoy and M. O. Robbins: *Physical Review E* **69**, 056103 (2004)

Book Chapter

"Modeling strain hardening in polymer glasses using molecular simulations", in *Polymer Glasses* (edited by Connie B. Roth): CRC Press, 2016.

Ph.D. Theses Advised

3. Void formation in model liquids, polymer glasses, and granular materials
Kai Nan; Ph.D. awarded 9/6/2023

2. Coarse-grained modeling studies of entangled semiflexible polymers: melts, glasses, and granular media
Joseph D. Dietz; Ph.D. awarded 10/21/2022

1. Coarse-grained modeling studies of polymeric and granular systems
Hong T. Nguyen; Ph.D. awarded 5/4/2018