

Ronald E. Cohen

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My research uses first-principles methods to understand, predict properties, and design materials. I have a classical background in geology, but have studied and applied computational physics extensively to the understanding of Earth and technological materials. I work closely with experimentalists to design and understand experiments, with geophysicists and geochemists to understand Earth structure and behaviour, and with material scientists, physicists, and chemists to understand materials.

Professional Preparation:

Oberlin College		1975-1976
Indiana University	Geology	B.S., 1979
Harvard University	Geology	A.M., 1981
Harvard University	Geology	Ph.D., 1979-1985

Thesis: *Thermodynamics of Aluminous Pyroxenes: Effects of Short-Range Order*

Appointments:

1990-current: Senior Staff Member, Geophysical Laboratory
2015-current: Professor, Department for Earth and Environmental Sciences, LMU Munich
2015-current: Honorary Professor, Department of Physics, University College London, Gower Street, London, WC1E 6BT, UK
2013-2015: Honorary Professor, London Centre for Nanotechnology, University College London, Gower Street, London, WC1E 6BT, UK
2013-2015: Professor, Department of Earth Science, University College London, Gower Street, London, WC1E 6BT, UK
2000-2001: Visiting Professor, Materials Science and Geophysics, California Institute of Technology
1988-1990: Visiting Investigator, Geophysical Laboratory
1987-1990: Research Physicist, Naval Research Laboratory
1985-1987: Research Associate, National Research Council, NRL

Publications and invited talks:

218 papers published, 234 invited talks, h-index: 60, 66 citations/paper, 39 papers with over 100 citations

Two most cited papers:

Cohen, R.E., Origin of ferroelectricity in oxide ferroelectrics. *Nature* 1992. 358: p. 136-138, citations: 1763.

H. Fu and R.E. Cohen, Polarization rotation mechanism for ultrahigh electromechanical response in single-crystal piezoelectrics, *Nature* 2000. 403: p. 281-283, citations: 1346.

Synergistic Activities and Professional Service:

Developed and fostered field of theory of ferroelectrics by a series of annual workshops beginning in 1990

Contributed in development of public codes and methods used to simulate materials at the atomic scale

Edited High-Performance Computing Requirements for the Computational Solid Earth Sciences, 96 pp, 2005.

Served as chair and serves as member of Mineral and Rock Physics Committee of AGU

Honors and Memberships in Professional Societies:

International Award of Ferroelectric Materials and Their Applications, FMA, May 29, 2014, European Research Council Advanced Grant, 2013, Dana Medal, Mineralogical Society of America, 2009, Fellow of American Physical Society, 2002, Fellow of American Geophysical Union, 2002, Doornbos Memorial Prize from International Association of Seismology and Physics of the Earth's Interior (IASPEI), 1994, Mineralogical Society of America Award and Life Fellow, 1994, Berman Research Publication Award, NRL, 1993, IBM Supercomputing Competition, Second Prize in Science, 1990, Berman Research Publication Award, NRL, 1988, National Research Council, Research Associateship, 8/85-8/87, National Science Foundation Graduate Fellowship, 9/79-8/82, Member, American Association for the Advancement of Science, Member, Member, Geological Society of America, Member, Phi Beta Kappa, Sigma Xi

Ten most cited publications published in last ten years h-index 60

Wu, Z. G. & Cohen, R. E. More Accurate Generalized Gradient Approximation for Solids. *Physical Review B* 73, doi:235116 10.1103/PhysRevB.73.235116 (2006). Citations: 1035.

Ahart, M., Somayazulu, M., Cohen, R. E., Ganesh, P., Dera, P., Mao, H. K., Hemley, R. J., Ren, Y., Liermann, P. & Wu, Z. G. Origin of Morphotropic Phase Boundaries in Ferroelectrics. *Nature* 451, 545-U542, doi:10.1038/nature06459 (2008). Citations: 358.

Wu, Z. G. & Cohen, R. E. Pressure-Induced Anomalous Phase Transitions and Colossal Enhancement of Piezoelectricity in PbTiO₃. *Physical Review Letters* 95, doi:037601 10.1103/PhysRevLett.95.037601 (2005). Citations: 283.

Xiao-Jia Chen, Viktor V Struzhkin, Zhigang Wu, Maddury Somayazulu, Jiang Qian, Simon Kung, Axel Nørlund Christensen, Yusheng Zhao, Ronald E Cohen, Ho-kwang Mao, Russell J Hemley, Hard superconducting nitrides, *Proceedings of the National Academy of Sciences*, 102, 3198-3201 (2005) Citations: 158.

Wu, Z. G., Chen, X. J., Struzhkin, V. V. & Cohen, R. E. Trends in Elasticity and Electronic Structure of Transition-Metal Nitrides and Carbides from First Principles. *Physical Review B* 71, doi:214103 10.1103/PhysRevB.71.214103 (2005). Citations: 134.

Caracas, R. & Cohen, R. E. Effect of Chemistry on the Stability and Elasticity of the Perovskite and Post-Perovskite Phases in the MgSiO₃-FeSiO₃-Al₂O₃ System and Implications for the Lowermost Mantle. *Geophysical Research Letters* 32, doi:L16310 10.1029/2005gl023164 (2005). Citations: 97.

Mao, W. L., Meng, Y., Shen, G. Y., Prakapenka, V. B., Campbell, A. J., Heinz, D. L., Shu, J. F., Caracas, R., Cohen, R. E., Fei, Y. W., Hemley, R. J. & Mao, H. K. Iron-Rich Silicates in the Earth's D " Layer. *Proceedings of the National Academy of Sciences of the United States of America* 102, 9751-9753, doi:10.1073/pnas.0503737102 (2005). Citations: 76.

Sha, X and R.E. Cohen, Lattice dynamics and thermodynamics of bcc iron under pressure: First-principles linear response study, *Physical Review B*, 73, 104303 (2006). Citations: 62

Caracas, R. and R.E. Cohen, Prediction of a new phase transition in Al₂O₃ at high pressures,, *Geophysical Research Letters* 32 (6) (2005). Citations: 47

R.E. Cohen, Relaxors go critical, *Nature* 441 (7096), 941-942 (2006). Citations: 47

Patents

U.S. Patent No. 8,039,131 B2 October 18, 2011	Class of pure piezoelectric materials
U.S. Patent No. 8,287,831 October 16, 2012	Oxynitride Perovskites
U. S Patent No. 8,721,915 B2 May 2014	Ordered Oxynitride Perovskites