Janet Rankin

Education

1983 S.B., Brown University, Materials Engineering

1989 Ph.D., Massachusetts Institute of Technology, Materials Science

Research and Professional Experience

2017-present:	Director, Teaching and Learning Lab, Massachusetts Institute of Technology
2015-2017:	Interim Director, Teaching and Learning Lab, Massachusetts Institute of Technology
2010-2015:	Senior Associate Director, Teaching and Learning Lab, Massachusetts Institute of Technology
2006-2010:	Associate Director, Teaching and Learning Lab, Massachusetts Institute of Technology
2010-2014:	Visiting Associate Professor, School of Engineering, Brown University
2000-2010:	Associate Professor (Research), School of Engineering, Brown University
1999-2006:	Associate Director for Physical and Life Sciences, Harriet W. Sheridan Center For Teaching and Learning, Brown University
1991-2000:	Assistant Professor (Research), Brown University
1991-1992:	Bunting Fellow, Harvard University
1989-1991:	Research Staff, Solid State Division, Oak Ridge National Laboratory

As Director of the Teaching + Learning Lab, Dr. Rankin works with faculty and departments to integrate efforts to promote better learning at MIT with departmental needs and constraints. Her work supports the strategic priorities of the Office of the Vice Chancellor. Her interests include: evidence-based teaching, applying the science of learning, improving learning in large-classes, interdisciplinary learning and teaching, and working with departments to support the professional development of TAs.

Teaching

MIT

- Teaching College Level Science and Engineering (2011 - present). Click here for the "This Course @ MIT" site for this course on MIT's OpenCourseWare (OCW).
- Kaufman Teaching Certificate Program: non-credit (2009 – present).
- Educational Technology Teaching Certificate Program: non-credit (2015 – present).

Brown University - School of Engineering

- Undergraduate and graduate level courses: Introduction to Materials Science, Dynamics & Vibrations, Thermodynamics, Materials Thermodynamics, Chemical Thermodynamics, Physical Chemistry of Solids, Crystallography, Electron Microscopy (1993-2010).

Selected Publications

1. D. Shah, J. French, J. Rankin, & L. Breslow, Using Video to Tie Engineering Themes to Foundational Concepts, Proceedings of the ASEE Annual Conference, Atlanta, GA (2013). Awarded "Best Conference Paper" - 2013.
2. B.W. Sheldon, S. Mandowara, and J. Rankin, "Grain boundary induced compositional stress in nanocrystalline ceria films", *Solid State Ionics*, **233** 38–46 (2013).
3. A. Locknar, R. Mitchell, J. Rankin, and D.R. Sadoway Integration of Information Literacy Components into a Large First-Year Lecture-Based Chemistry Course, *Journal of Chemical Education* February (2012). http://dx.doi.org/10.1021/ed200252q.
4. A.K. Kothari, K. Jian, J. Rankin, and B.W. Sheldon, "Comparison Between Carbon Nanotube and Carbon Nanofiber Reinforcements in Amorphous Silicon Nitride Coatings", *J. Am. Ceram. Soc*. **91**, 2743-2746 (2008).
5. X. Xiao, Y.-T. Cheng, B.W. Sheldon, and J. Rankin, **"**Condensed water on superhydrophobic carbon films**",** *J Mater Res.* **23**, 2174-2178 (2008).
6. Gaidarzhy, M. Imboden, P. Mohanty, J. Rankin, and B.W. Sheldon, "High quality factor gigahertz frequencies in nanomechanical diamond resonators", *Appl. Phys. Lett.* **91**, 203503 (2007).
7. M. Imboden, P. Mohanty, A. Gaidarzhy, J. Rankin, and B.W. Sheldon, "Scaling of dissipation in megahertz-range micromechanical diamond oscillators", *Appl. Phys. Lett.* **90**, 173502 (2007).
8. R. Krishnamurthy, J. Rankin, and B.W. Sheldon, "Effect of Oxidation on Crack Deflection in SiC / Al_2O_3 Laminated Ceramic Composites", *J. Am. Ceram. Soc.* **88**, 1362-1365 (2005).
9. Rajamani, B. W. Sheldon, S. Nijhawan, A. Schwartzman, J. Rankin, B. Walden, L. Riester, "Chemistry-induced intrinsic stress variations during the chemical vapor deposition of polycrystalline diamond", *Journal of Applied Physics*, **96**, 3531-3539 (2004).
10. B.W. Sheldon, A. Ditkowski, R. Beresford, E. Chason, and J. Rankin, "Intrinsic compressive stress in polycrystalline films with negligible grain boundary diffusion", *Journal of Applied Physics,* **94**, 948-57 (2003).
11. B.W. Sheldon and J. Rankin, Step-Energy Barriers and Particle Shape Changes during Coarsening, *J. Am. Ceram. Soc.*, 85, 683-90 (2002).
12. Deborah M. Vernon, Janet Rankin, Christine Caragianis-Broadbridge, and Bruce Laube, "A Processing Route to Control Grain Growth in Submicron Alumina Compacts", *J. Am. Ceram. Soc*., **82** (1999) p. 2969.
13. J. Rankin, B.W. Sheldon, "Surface Roughening and Unstable Neck Formation in Particles, I: Experimental Results and Mechanisms", *J. Am. Ceram. Soc*., **82** (1999) p. 1868.
14. B.W. Sheldon, J. Rankin, , "Surface Roughening and Unstable Neck Formation in Particles, II: Mathematical Modelling", *J. Am. Ceram. Soc*., **82** (1999) p. 1873.
15. J. Rankin, "*In Situ* TEM Heating of ZrO_2", *J. Am. Ceram. Soc*., 82 (1999) p. 1560.
16. R.C. Picu, J. Rankin, and A.F. Schwartzman, "Direct observation of surface sublimation and relaxation in CdTe{111} films by high-resolution transmission electron microscopy" *Phil. Mag. Lett*, 79 (1999) p. 241

17. L.J. Romana, J. Rankin, J.R. Brewster, L.A. Boatner, A.M. Williams, “Stability of ion-implanted layers on MgO under Ultrasonic Cavitation”, *J. Appl. Phys*. 80 (5) (1996) p. 2781.

18. J. Rankin and B.W. Sheldon, "*In Situ* TEM Sintering of Nanosized ZrO_2 Particles", *Mater. Sci. & Eng. A*, 204 (1995) p.48.

19. J. Rankin J.C. McCallum, and L.A. Boatner, "Annealing-Environment Effects in the Epixatial Regrowth of Ion-Beam-Amorphized Layers on $CaTiO_3$" *J. Appl. Phys*. 78 (3) (1995) 1519.

20. B.W. Sheldon, J. Rankin, and J.S. Haggerty, "The Formation of Silicon Nitride from Silane Derived Silicon Powders: Nucleation and Growth Mechanisms", *J. Am. Ceram. Soc*., 78 (1995) p.1624.

21. J. Rankin and L.A. Boatner, "Unstable Neck Formation during Initial Stage Sintering", *J. Am. Ceram. Soc*., 77 (1994) p. 1987.

22. J. Rankin, R.E. Boekenhauer, R. Csencsits, Y. Shigesato, M.W. Jacobson, and B.W. Sheldon, "Nucleation and growth during the chemical vapor deposition of diamond on SiO_2 substrates", *J. Mater. Res*. 9 (1994) p. 2164.

23. B.W. Sheldon, R. Csencsits, J. Rankin, R.E. Boekenhauer, and Y. Shigesato, "Bias-enhanced nucleation of diamond during microwave-assisted chemical vapor deposition", *J. Appl. Phys*., 75 (1994) p. 5001.

24. J. Rankin, B.W. Sheldon, and L.A. Boatner, "The Measurement and Analysis of Epitaxial Recrystallization Kinetics in Ion-Beam Amorphized $SrTiO_3$", *J. Mater. Res*., 9 (1994) p. 3113.

25. B.W. Sheldon, J. Rankin, and J.S. Haggerty, "The Formation of Silicon Nitride from Silane Derived Silicon Powders: Nucleation and Growth Mechanisms", *J. Am. Ceram. Soc*., (1994).

26. J. Rankin, J.C. McCallum, and L.A. Boatner, "Annealing Environment Effects in the Epitaxial Regrowth of Ion-Beam Amorphized Layers of $CaTiO_3$", *J. Appl. Phys*., submitted (1994).

27. .R. Brenier, B. Canut, L. Gea, S.M.M. Ramos, P. Thevenard, J. Rankin, L. Romana, and L.A. Boatner, "Plastic flow induced by ionization processes in ion-damaged MgO", *Nucl. Inst and Meth*. B80/81 (1993) p. 1210.

28. J. Rankin, P. Thevenard, L.J. Romana, L.A. Boatner, C.W. White, C.J. McHargue, and L.L. Horton, "Ion bombardment, ultrasonic, and pulsed laser beam effects on small metallic clusters of potassium in MgO", *Surface and Coatings Technology* 51 (1992) p. 471.

29. J. Rankin, J.C. McCallum, and L.A. Boatner, "The Effect of Annealing Environment on the Epitaxial Recrystalliztion of Ion-Beam-Amorphized $SrTiO_3$", *J. Mater. Res*. 7 (1992) p. 717.

30. J.C. McCallum, J. Rankin, C.W. White and L.A. Boatner; "Time-Resolved Reflectivity Measurements in Pb-Implanted $SrTiO_3$", *Nucl. Inst. and Meth. in Phys. Res*. B46 (1990) p. 98.

31. C.W. White, L.A. Boatner, P.S. Sklad, C.J. McHargue, J. Rankin, G.C. Farlow and M.J. Aziz; "Ion Implantation and Annealing in Crystalline Oxides and Ceramic Materials", *Nucl. Inst. and Meth. in Phys. Res*. B32 (1988) p. 11.

32. J. Rankin, L.W. Hobbs, L.A. Boatner and C.W. White; "An *In-Situ* Annealing Study of Lead-Implanted Single Crystal Calcuim Titanate", *Nucl. Inst. and Meth.in Phys. Res*. B32 (1988) p.28.

33. E.M. Foltyn, F.W. Clinard, Jr., J. Rankin and D.E. Peterson; "Self-Irradiation Effects in Pu^{238} Substituted Zirconolite - II: Effect of Damage Microstructure on Recovery", *J. Nucl. Mat*., 136 (1985) p. 97.

Other Refereed Articles

1. B.W. Sheldon, S. Nijhawan, J. Rankin, and B.L. Walden, “Methane Effects on Grain Boundary formation and Intrinsic Stress in CVD Diamond”, in Proceedings of the Sixth International Symposium on Diamond Materials, eds. J. C. Angus, W. D. Brown, and A. Gicquel (Electrochemical Society, Pennington, N.J., 2000), pp. 175-184.

2. S. Nijhawan, J. Rankin, B.L. Walden, and B.W. Sheldon, “Grain Impingement and Intrinsic Stress in CVD Diamond”, in Thin Films – Stresses and Mechanical Properties VII – MRS Symposium Proc., Vol. 505, edited by R. Cammarata, M. Nastasi, E. Busso, and W.C. Oliver, (Materials Research Society, Pittsburgh, 1998). pp. 415-420.

3. V.M. Kneppens, J. Rankin, and L.A. Boatner, “The Formation of Metal/Metal Matrix Nano-Composites by the Ultrasonic Dispersion of Immiscible Liquid Metals, Presented at theAnnual Meeting of the MRS Society, December 1996.

4. L.A. Gea, L.A. Boatner, J. Rankin, and J.D. Budai, "The Formation of Al_2O_3/V_2O_3 Multilayer Structures by High-Dose Ion Implantation, in Materials Modification by Energetic Atoms and Ions - MRS Symposium Proceedings, Vol. 271 (Materials Research Society, Pittsburgh, PA., 1995).

5. B.W. Sheldon, Y. Shigesato, R.E. Boekenhauer, and J. Rankin, "Diamond Nucleation during Bias-enhanced Chemical Vapor Deposition", in Proceedings of the Third International Symposium on Diamond Materials, edited by J.P. Dismukes and K.V. Ravi (Electrochemical Society, Pennington, N.J., 1993) p. 229.

6. F.S. Lauten, J. Rankin, and B.W. Sheldon, "Nucleation and Growth of Polycrystalline Si_3N_4 During Chemical Vapor Deposition", in Silicon Nitride Ceramics - MRS Proceedings, Vol. 287, ed. by I.-W. Chen et. al., (Materials Research Society, Pittsburgh, PA., 1993), p. 315.

7. R. Csencsits, J. Rankin, R.E. Boekenhauer, M.K. Kundmann, and B.W. Sheldon, "Early Stage Microstructure Evolution during the Chemical Vapor Deposition of Diamond Films", in Evolution of Surface and Thin Film Microstructure - MRS Symposium Proceedings, Vol 280, edited by H.A. Atwater, E. Chason, M. Grabow, and M. Lagally, (Materials Research Society, Pittsburgh, PA., 993), p. 695.

8. J.C. McCallum, T.W. Simpson, I.V. Mitchell, J. Rankin and L.A. Boatner; "Annealing of Pb-Implanted $SrTiO_3$ in the Presence of Water Vapour: A Study Using D_2O^{18} Labelling", Materials Modification by Energetic Atoms and Ions - MRS Symposium Proceedings, Vol. 268, edited by K. Grabowski et. al. (Materials Research Society, Pittsburgh, PA., 1992).

9. J. Rankin, Y. Shigesato, R.E. Boekenhauer, R. Csencsits, D.C. Paine, and B.W. Sheldon, "Early Stages in the Microwave-assisted Chemical Vapor Deposition of Diamond Films on Glass Substrates", Novel Forms of Carbon - MRS Symposium Proceedings, Vol. 270, edited by C.L. Renschler, J. Pouch, and D. Cox (Materials Research Society, Pittsburgh, PA., 1992), p. 317.

10. J. Rankin, J.C. McCallum, L.A. Boatner, C.W. White; "A Rutherford Backscattering Spectroscopy and Transmission Electron Microscopy Study of the Ion Implantation and Annealing Processes in Single

Crystal Calcium Titanate", Selected Topics in Electronic Materials, edited by: B.R. Appleton, W.L. Brown, D.K. Biegelsen, J.A. Knapp, Materials Research Society, Pittsburg, PA, (1988) p. 28.

11. J. Rankin, L.A. Boatner, C.W. White, L.W. Hobbs; "A Cross-Sectional TEM Study of the Effects of Annealing Conditions on the Regrowth of Lead-Implanted Single Crystal Calcium Titanate", Fundamentals of Beam-Solid Interactions and Transient Processes, Materials Research Society Symposium Proceedings - Vol.100, edited by: M.J. Aziz, L.E Rehn and B. Stritzker, Materials Research Society, Pittsburg, PA, 1988.

12. F.W. Clinard, Jr., D.S. Tucker, G.F. Hurley, C.D. Kise and J. Rankin; "Irradiation-Induced Reduction of Microcracking in Zirconolite", Scientific Basis for Nuclear Waste Management VII - Vol. 44, edited by: C.M. Jantzen, J. A. Stone and R.C. Ewing, Elsevier Science Publishing Co., Inc., 1985.

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Doctoral Advisor: Professor Linn Hobbs, MIT

Former Graduate Students / Post-Docs:
Rachel Koritala (staff, Argonne Nat'l Lab), Catalin Picu (faculty, RPI), Deborah Vernon (patent attorney, Proskauer Rose LLP), Tai Hee Eun (S. Korea).