

## A. JOHN HART

Associate Professor of Mechanical Engineering  
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### Appointments

Associate Professor, Mechanical Engineering, MIT, July 2013 – Present  
Assistant Professor, Mechanical Engineering, University of Michigan, Sept. 2007 – June 2013  
Assistant Professor, Applied Physics Program, University of Michigan, Sept. 2010 – June 2013  
Assistant Professor, School of Art and Design, University of Michigan, April 2009 – June 2013  
Postdoctoral Associate, Mechanical Engineering, Aeronautics/Astronautics, and Materials Science and Engineering, MIT, Sept. 2006 – July 2007

### Education

B.S.E, Mechanical Engineering (GPA 4.0/4.0), University of Michigan, 2000  
S.M., Mechanical Engineering (GPA 5.0/5.0), Massachusetts Institute of Technology, 2002  
Ph.D., Mechanical Engineering (GPA 5.0/5.0), Massachusetts Institute of Technology, 2006

### Awards (since beginning graduate school)

National Science Foundation Graduate Research Fellowship	2000-2002
American Society of Precision Engineering R.V. Jones Memorial Scholarship	2002
Fannie and John Hertz Foundation Graduate Fellowship	2002-2006
European Society of Precision Engineering Heidenhain Scholarship	2005
MIT Senturia Prize for Outstanding Doctoral Thesis in Micro/Nanosystems	2006
Finalist, MIT Clean Energy Entrepreneurship Prize	2008
Young Faculty Award (YFA), Defense Advanced Research Projects Agency	2008
R&D100 Award (SabreTube Desktop Thermal Processing System)	2008
Holcim Next Generation Award for Sustainable Construction (with N. Oxman)	2008
Pi Tau Sigma Gold Medal, American Society of Mechanical Engineers	2009
<i>Annual award for outstanding achievement in mechanical engineering within ten years of receiving a baccalaureate degree</i>	
R&D100 Award (Spin-Grower Layer-by-Layer Assembly System)	2009
Outstanding Faculty Achievement Award, U. Michigan Mechanical Engineering	2010
Outstanding Young Mfg. Engineer Award, Society of Mfg. Engineers (SME)	2010
Frontiers of Engineering Attendee, National Academy of Engineering	2010
Robert M. Caddell Award in Manufacturing, University of Michigan	2011
<i>Annual award for leadership of an outstanding research team in materials and manufacturing</i>	
Young Investigator Program (YIP) Award, Air Force Office of Scientific Research	2011
CAREER Award, National Science Foundation (CMMI/Nanomanufacturing)	2012
1938E Award, University of Michigan College of Engineering	2012
<i>Highest award given annually to one Assistant Professor in the College of Engineering</i>	
Young Investigator Program (YIP) Award, Office of Naval Research	2012
Mitsui Career Development Chair, MIT	2013
Best Paper Award in Compliant Mechanisms (with J. Beroz and S. Awtar), 37th Mechanisms and Robotics Conference, ASME IDETC	2013
3M Nontenured Faculty Award	2014
Best Poster Award, Materials Research Society Fall Meeting	2014

## **Refereed Journal Publications (Google Scholar)**

1. A.H. Slocum, M. Basaran, R. Cortesi, A.J. Hart. Linear motion carriage with aerostatic bearings preloaded by inclined iron core linear electric motor, *J. Int'l. Soc. Precision Engineering and Nanotechnology* 27, 382-394, 2003, [http://dx.doi.org/10.1016/S0141-6359\(03\)00037-0](http://dx.doi.org/10.1016/S0141-6359(03)00037-0).
2. A.J. Hart, A.H. Slocum, P.J. Willoughby. Kinematic coupling interchangeability, *J. Int'l. Soc. Precision Engineering and Nanotechnology*, 28:1-15, 2004, <http://dx.doi.org/10.1016/j.precisioneng.2004.01.002>.
3. A.J. Hart, A.H. Slocum, J. Sutin. Segmented and shielded structures for reduction of thermal expansion-induced tilt errors, *J. Int'l. Soc. Precision Engineering and Nanotechnology*, 28:443-458, 2004, <http://dx.doi.org/10.1016/j.precisioneng.2004.01.002>.
4. P.J. Willoughby, A.J. Hart, A.H. Slocum. Experimental determination of kinematic coupling repeatability in industrial and laboratory conditions, *SME J. Manufacturing Systems* 24:108-121, 2005, <http://proquest.umi.com/pqdlink?did=1075698831&Fmt=7&clientId=5482&RQT=309&VName=PQD>.
5. A.J. Hart, A.H. Slocum, L. Royer. Growth of conformal single-walled carbon nanotube films from Mo/Fe/Al<sub>2</sub>O<sub>3</sub> deposited by electron beam evaporation, *Carbon*, 44(2):348-359, 2006, <http://dx.doi.org/10.1016/j.carbon.2005.07.008>.
6. A.J. Hart, B.O. Boskovic, A.T.H. Chuang, V.B. Golovko, J. Robertson, B.F.G. Johnson, A.H. Slocum. Uniform and selective cvd growth of carbon nanotubes and nanofibers on arbitrarily microstructured silicon surfaces, *Nanotechnology* 17:1397-1403, 2006, <http://dx.doi.org/10.1088/0957-4484/17/5/039>.
7. A.J. Hart, A.H. Slocum. Rapid growth and flow-mediated nucleation of millimeter-scale aligned carbon nanotube structures from a thin-film catalyst (cover article), *J. Physical Chemistry B* 110(16):8250-8257, 2006, <http://dx.doi.org/10.1021/jp055498b>.
8. A.J. Hart, A.H. Slocum. Force output, control of film structure, and micro-scale shape replication by carbon nanotube growth under mechanical pressure, *Nano Letters* 6:1254-1260, 2006, <http://dx.doi.org/10.1021/nl0524041>.
9. R.D. Bennett, A.J. Hart, R.E. Cohen. Controlling the morphology of carbon nanotube films by varying the areal density of catalyst nanoparticles using block copolymer micellar thin films, *Advanced Materials* 18:2274-2279, 2006, <http://dx.doi.org/10.1002/adma.200600975>.
10. R.D. Bennett, A.J. Hart, A.C. Miller, P.T. Hammond, D.J. Irvine, R.E. Cohen. Creating patterned carbon nanotube catalysts through the microcontact printing of block copolymer micellar thin films, *Langmuir* 22:8273-8276, 2006, <http://dx.doi.org/10.1021/la061054a>.
11. O. Yaglioglu, A.J. Hart, R. Martens, A.H. Slocum. Method of characterizing electrical contact properties of carbon nanotube coated surfaces, *Review of Scientific Instruments* 77:095105, 2006, <http://dx.doi.org/10.1063/1.2349300>.
12. E.J. García, A.J. Hart, B.L. Wardle, A.H. Slocum. Fabrication of composite microstructures by capillarity-driven wetting of aligned carbon nanotubes with polymers, *Nanotechnology* 18(16):165602, 2007, <http://dx.doi.org/10.1088/0957-4484/18/16/165602>.
13. A.J. Hart, L.C. van Laake, A.H. Slocum. Desktop growth of carbon nanotube monoliths with in situ optical imaging, *Small* 3(5):772-777, 2007, <http://dx.doi.org/10.1002/smll.200600716>.
14. B.N. Wang, R.D. Bennett, E. Verploegen, A.J. Hart, R.E. Cohen. Quantitative characterization of the morphology of multi-wall carbon nanotube films by small-angle X-ray scattering, *J. Physical Chemistry C* 111(16):5859-5865, 2007, <http://dx.doi.org/10.1021/jp068895a>.
15. E.J. García, A.J. Hart, B.L. Wardle, A.H. Slocum. Fabrication and nanocompression testing of aligned CNT/polymer nanocomposites, *Advanced Materials* 19:2151-2156, 2007, <http://dx.doi.org/10.1002/adma.200700237>.
16. L.C. van Laake, A.J. Hart, A.H. Slocum. A suspended heated silicon platform for rapid thermal control of surface reactions with application to carbon nanotube synthesis, *Review of Scientific Instruments* 78:083901, 2007, <http://dx.doi.org/10.1063/1.2760936>.
17. B.N. Wang, R.D. Bennett, E. Verploegen, A.J. Hart, R.E. Cohen. Characterizing the morphologies of mechanically-manipulated multi-wall carbon nanotube films by small-angle X-ray scattering, *J. Physical Chemistry C* 111(48):17933-17940, 2007, <http://dx.doi.org/10.1021/jp071798c>.

18. A.J. Hart, H.K. Taylor, A.H. Slocum. 2D and 3D growth of carbon nanotubes on substrates, from nanometre to millimetre scales. *International J. Nanomanufacturing* 1(6):701-709, 2007.
19. D. Bello, A.J. Hart, K. Ahn, M. Hallock, N. Yamamoto, E.J. Garcia, B.L. Wardle, M.J. Ellenbecker. Particle exposure levels during growth and subsequent handling of vertically aligned carbon nanotube films. *Carbon* 46:974-977, 2008, <http://dx.doi.org/10.1016/j.carbon.2008.03.003>.
20. O. Yaglioglu, R. Martens, A.J. Hart, A.H. Slocum. Conductive carbon nanotube composite microprobes. *Advanced Materials* 20:357-362, 2008, <http://dx.doi.org/10.1002/adma.200700075>.
21. E.J. Garcia, A.J. Hart, B.L. Wardle. Long carbon nanotubes grown on the surface of fibers for hybrid composites. *AIAA Journal* 46(6):1405-12, 2008, <http://dx.doi.org/10.2514/1.25004>.
22. E.J. García, B.L. Wardle, A.J. Hart, N. Yamamoto. Fabrication and multifunctional properties of a hybrid laminate with aligned carbon nanotubes grown in situ. *Composites Science and Technology* 68:2034-2041, 2008, <http://dx.doi.org/10.1016/j.compscitech.2008.02.028>.
23. E.J. García, B.L. Wardle, A.J. Hart. Joining prepreg composite interfaces with aligned carbon nanotubes. *Composites Part A* 39(6):1065-1070, 2008, <http://dx.doi.org/10.1016/j.compositesa.2008.03.011>.
24. B.L. Wardle, D.S. Saito, E.J. García, A.J. Hart, R.G. de Villoria, E.A. Verploegen. Fabrication and characterization of ultra-high volume fraction aligned carbon nanotube polymer composites. *Advanced Materials* 20(14):2710-2714, 2008, <http://dx.doi.org/10.1002/adma.200800295>.
25. G.D. Nessim, A.J. Hart, J.S. Kim, D. Acquaviva, J. Oh, C.D. Morgan, M. Seita, J.S. Leib, C.V. Thompson. Tuning of vertically aligned carbon nanotube diameter and areal density through catalyst pre-treatment. *Nano Letters* 8(11):3587-3593, 2008, <http://dx.doi.org/10.1021/nl801437c>.
26. D. Bello, B.L. Wardle, K. Ahn, N. Yamamoto, E.J. García, A.J. Hart, M.J. Ellenbecker. Exposure to nanoscale particles and fibers during machining of advanced composites containing carbon nanotubes. *Journal of Nanoparticle Research* 11(1):231-249, 2009, <http://dx.doi.org/10.1007/s11051-008-9499-4>.
27. N. Grossiord, J. Loos, L.C. van Laake, M. Maugey, C. Zakri, C.E. Koning, A.J. Hart. High-conductivity polymer nanocomposites obtained by tailoring the characteristics of carbon nanotube fillers. *Advanced Functional Materials* 18(20):3226-3234, 2008. <http://dx.doi.org/10.1002/adfm.200800528>.
28. E.R. Meshot, A.J. Hart. Abrupt self-termination of vertically aligned carbon nanotube growth. *Applied Physics Letters* 92:113107, 2008, <http://dx.doi.org/10.1002/10.1063/1.2889497>.
29. P. Podsiadlo, M. Michel, J. Lee, E. Verploegen, N.W.S. Kam, J. Lee, Y. Qi, A.J. Hart, P.T. Hammond, N.A. Kotov. Exponential growth of LBL films with incorporated inorganic sheets, *Nano Letters* 8(6):1762-1770, 2008, <http://dx.doi.org/10.1021/nl8011648>.
30. N. Yamamoto, A.J. Hart, B.L. Wardle, E.J. Garcia, S.S. Wicks, H.M. Duong, A.H. Slocum. High-yield growth of aligned carbon nanotubes on ceramic fibers for multifunctional enhancement of structural composites. *Carbon* 47(3):551-560, 2009, <http://dx.doi.org/10.1016/j.carbon.2008.10.030>.
31. S. Vozar, Y.C. Poh, T. Serbowicz, M. Bachner, P. Podsiadlo, M. Qin, E. Verploegen, N.A. Kotov, A.J. Hart. Automated spin-assisted layer-by-layer assembly of nanocomposites. *Review of Scientific Instruments* 80:023903, 2009, <http://dx.doi.org/10.1063/1.3078009>.
32. F. Hill, T.F. Havel, A.J. Hart, C. Livermore. Storing elastic energy in carbon nanotubes. *Journal of Micromechanics and Microengineering* 19:094015, 2009, <http://dx.doi.org/10.1088/0960-1317/19/9/094015>.
33. R. Guzman de Villoria, S.L. Figueredo, A.J. Hart, S.A. Steiner, A.H. Slocum, B.L. Wardle. High-yield growth of vertically aligned carbon nanotubes on a continuously moving substrate. *Nanotechnology* 20:405611, 2009, <http://dx.doi.org/10.1088/0957-4484/20/40/405611>.
34. H. Cebici, R. Guzman de Villoria, A.J. Hart, B.L. Wardle. Multifunctional properties of high volume fraction aligned carbon nanotube polymer composites with controlled morphology. *Composites Science and Technology* 69:2649-2656, 2009, <http://dx.doi.org/10.1016/j.compscitech.2009.08.006>.
35. G.D. Nessim, M. Seita, K.P. O'Brien, R.R. Mitchell, A.J. Hart, C.V. Thompson. Low temperature synthesis of vertically aligned carbon nanotubes with ohmic contact to metallic substrates enabled by thermal decomposition of the carbon feedstock. *Nano Letters* 9(10):3398-3405, 2009, <http://dx.doi.org/10.1021/nl900675d>.

36. P. Podsiadlo, M. Michel, K. Critchley, S. Srivastava, M. Qin, J.W. Lee, E.A. Verploegen, A.J. Hart, Y. Qi, N.A. Kotov. Diffusional self-organization in exponential layer-by-layer with micro- and nanoscale periodicity. *Angewandte Chemie International Edition* 48(38):7073-7077, 2009, <http://dx.doi.org/10.1002/anie.200901720>.
37. S.A. Steiner, T.F. Baumann, B.C. Bayer, M.A. Worsley, W.J. Moberlychan, E.L. Shaw, A.J. Hart, S. Hofmann, B.L. Wardle. Nanoscale zirconia as a versatile non-metallic catalyst for graphitization of carbon and growth of single- and multi-wall carbon nanotubes. *Journal of the American Chemical Society* 131:12144-12154, 2009, <http://dx.doi.org/10.1021/ja902913r>.
38. S. Tawfick, K.P. O'Brien, A.J. Hart. Flexible high conductivity carbon nanotube interconnects made by rolling and printing. *Small* 5(21):2467-2473, 2009, <http://dx.doi.org/10.1002/sml.200900741>.
39. E.R. Meshot, D.L. Plata, S. Tawfick, E. Verploegen, A.J. Hart. Engineering vertically aligned carbon nanotube growth by decoupled thermal treatment of precursor and catalyst. *ACS Nano* 3(9):2477-2486, 2009, <http://dx.doi.org/10.1021/nn900446a>.
40. D.L. Plata, A.J. Hart, C.M. Reddy, P.M. Gschwend. Early evaluation of potential environmental impacts of carbon nanotube synthesis by chemical vapor deposition. *Environmental Science and Technology* 43(21):8367-8373, 2009, <http://pubs.acs.org/doi/abs/10.1021/es901626p>.
41. M. Bedewy, E.R. Meshot, H. Guo, E.A. Verploegen, W. Lu, A.J. Hart. Collective mechanism of evolution and self-termination of vertically aligned carbon nanotube growth. *Journal of Physical Chemistry C* 113:20576-20582, 2009, <http://pubs.acs.org/doi/abs/10.1021/jp904152v>.
42. M. De Volder, D.O. Vidaud, E.R. Meshot, S. Tawfick, A.J. Hart. Self-similar organization of arrays of individual carbon nanotubes and carbon nanotube micropillars. *Microelectronic Engineering* 87(5-8):1233-1238, 2010, <http://dx.doi.org/10.1016/j.mee.2009.11.139>.
43. S. Tawfick, X. Deng, A.J. Hart, J. Lahann. Nanocomposite microstructures with tunable mechanical and chemical properties. *Physical Chemistry Chemical Physics* 12:4446-4451, 2010, <http://dx.doi.org/10.1039/c000304m>.
44. M. Bedewy, E.R. Meshot, K.M. Lyons, A.R. Woll, K.A. Juggernaut, S. Tawfick, A.J. Hart. Measuring the lengthening kinetics of vertically aligned nanostructures by spatiotemporal correlation of height and orientation. *Nanoscale* 2:896-900, 2010, <http://dx.doi.org/10.1039/b9nr00343f>.
45. Y. Zhang, J. Gregoire, R.B. Van Dover, A.J. Hart. Ethanol-promoted growth of few-walled vertically aligned carbon nanotubes. *Journal of Physical Chemistry C* 114(14):6389-6395, 2010, <http://dx.doi.org/10.1021/jp100358j>.
46. F.A. Hill, T.F. Havel, A.J. Hart, C. Livermore. Characterizing the failure processes that limit the storage of energy in carbon nanotube springs under tension. *Journal of Micromechanics and Microengineering* 20:104012, 2010, <http://dx.doi.org/10.1088/0960-1317/20/10/104012>.
47. J.G. Ok, S. Tawfick, K.A. Juggernaut, K. Sun, Y. Zhang, A.J. Hart. Electrically-addressable hybrid architectures of zinc oxide nanowires grown on aligned carbon nanotubes. *Advanced Functional Materials* 20:2470-2480, 2010, <http://dx.doi.org/10.1002/adfm.201000249>. Frontspiece feature.
48. M. De Volder+, S. Tawfick+ (+equal contribution), S. Park, D. Copic, Z. Zhao, W. Lu, A.J. Hart. Diverse 3D microarchitectures made by capillary forming of carbon nanotubes (cover article). *Advanced Materials* 22:4384-4389, 2010, <http://dx.doi.org/10.1002/adma.201001893>.
49. Z. Zhao, S. Tawfick, S.J. Park, M. De Volder, A.J. Hart, W. Lu. Bending of nanoscale filament assemblies by elastocapillary densification. *Physical Review E* 82:041605, 2010, <http://dx.doi.org/10.1103/PhysRevE.82.041605>.
50. D.L. Plata+, E.R. Meshot+ (+equal contribution), C.M. Reddy, A.J. Hart, P.M. Gschwend. Multiple alkynes react with ethylene to enhance carbon nanotube synthesis, suggesting a polymerization-like formation mechanism. *ACS Nano* 4(10):7185-7192, 2010, <http://dx.doi.org/10.1021/nn101842g>.
51. H.W. Baac, J.G. Ok, H.J. Park, T. Ling, S.L. Chen, A.J. Hart, L.J. Guo. Carbon nanotube composite optoacoustic transmitters for strong and high frequency ultrasound generation. *Applied Physics Letters* 97:234104, 2010, <http://dx.doi.org/10.1063/1.3522833>.

52. G.D. Nessim, M. Seita, D.L. Plata, K.P. O'Brien, A.J. Hart, E.R. Meshot, C.M. Reddy, P.M. Gschwend, C.V. Thompson. Precursor gas chemistry determines the crystallinity of carbon nanotubes synthesized at low temperature. *Carbon* 49(3):804-810, 2011, <http://dx.doi.org/10.1016/j.carbon.2010.10.018>.
53. J. Li, S. Srivastava, J.G. Ok, M. Bedewy, Y. Zhang, N.A. Kotov, A.J. Hart. Multidirectional hierarchical nanocomposites made by carbon nanotube growth within LBL-assembled films. *Chemistry of Materials* 23:1023-1031, 2011, <http://dx.doi.org/10.1021/cm1030443>.
54. M. De Volder, S. Park, S. Tawfick, A.J. Hart. Fabrication and electrical integration of robust carbon nanotube using self-directed elastocapillary densification. *Journal of Micromechanics and Microengineering* 21:045033, 2011, <http://dx.doi.org/10.1088/0960-1317/21/4/045033>.
55. D. Copic, S.J. Park, S. Tawfick, M. De Volder, A.J. Hart. Fabrication of high-aspect-ratio polymer microstructures and hierarchical textures using carbon nanotube composite master molds. *Lab on a Chip* 11(10):1831-1837, 2011, <http://dx.doi.org/10.1039/c0lc00724b>.
56. E.A. Verploegen, A.J. Hart, M. De Volder, S. Tawfick, K.K. Chia, R.E. Cohen. Non-destructive characterization of structural hierarchy within carbon nanotube assemblies. *Journal of Applied Physics* 109:094316, 2011, <http://dx.doi.org/10.1063/1.3584759>.
57. S. Tawfick, M. De Volder, A.J. Hart. Structurally programmed folding of vertical carbon nanotube assemblies. *Langmuir* 27(10):6389-6394, 2011, <http://dx.doi.org/10.1021/la200635g>.
58. R. Guzman de Villoria, A.J. Hart, B.L. Wardle. Continuous production of vertically aligned carbon nanotubes on 2D and 3D substrates. *ACS Nano* 5(6):4850-4857, 2011, <http://dx.doi.org/10.1021/nn2008645>.
59. M. De Volder, R. Vansweevelt, P. Wagner, D. Reynaerts, C. Van Hoof, A.J. Hart. Hierarchical carbon nanowire microarchitectures made by plasma-assisted pyrolysis of photoresist. *ACS Nano* 5(8):6593-6600, 2011, <http://pubs.acs.org/doi/abs/10.1021/nn201976d>.
60. M. De Volder, S. Tawfick, S. Park, A.J. Hart. Corrugated carbon nanotube microstructures with geometrically tunable compliance (cover article). *ACS Nano* 5(9):7310-7317, 2011, <http://dx.doi.org/10.1021/nn202156q>.
61. M. De Volder, S. Tawfick, D. Copic, A.J. Hart. Hydrogel-driven carbon nanotube microtransducers. *Soft Matter* 7:9844-9847, 2011, <http://dx.doi.org/10.1039/C1SM06215H>.
62. M. Bedewy, E.R. Meshot, M. Reinker, A.J. Hart. Population growth dynamics of carbon nanotubes. *ACS Nano* 5(11):8974-8989, 2011, <http://dx.doi.org/10.1021/nn203144f>.
63. S. Saha, D. Copic, S. Bhaskar, N. Clay, A. Donini, A.J. Hart, J. Lahann. Chemically controlled bending of compositionally anisotropic microcylinders. *Angewandte Chemie*, 51(3):660-665, 2012, <http://dx.doi.org/10.1002/anie.201105387>.
64. E.R. Meshot, K. Patel, S. Tawfick, K.A. Juggernaut, M. Bedewy, E.A. Verploegen, M. De Volder, A.J. Hart. Photoconductive hybrid films via directional self-assembly of C60 on aligned carbon nanotubes. *Advanced Functional Materials*, 22: 577-584, 2012, <http://dx.doi.org/10.1002/adfm.201102393>.
65. J. Beroz, M. Bedewy, M. Reinker\*, V. Chhajjer, S. Awtar, A.J. Hart. Four-degree-of-freedom liquid dispenser for direct-write capillary self-assembly with sub-nanoliter precision. *Review of Scientific Instruments* 83:015104, 2012, <http://dx.doi.org/10.1063/1.3673680>.
66. S. Tawfick, M. De Volder, D. Copic, S. Park, E.S. Polsen, C.R. Oliver, M.J. Roberts, A.J. Hart. Engineering of micro- and nanostructured surfaces with anisotropic geometries and properties (invited review). *Advanced Materials* 6:5091-5101, 2012, <http://dx.doi.org/10.1002/adma.201103796>.
67. S. Tawfick, A.J. Hart, M. De Volder. Capillary bending of Janus carbon nanotube micropillars. *Nanoscale* 4:3852-3856, 2012, <http://dx.doi.org/10.1039/C2NR30802A>.
68. D. Copic, S. Park, S. Tawfick, M. De Volder, A.J. Hart. Fabrication, densification, and replica molding of 3D carbon nanotube microstructures. *Journal of Visualized Experiments* 65:e3980, 2012, <http://dx.doi.org/10.3791/3980>.
69. G.D. Nessim, A. Al-Obeidi, H. Grisaru, E.S. Polsen, C.R. Oliver, T. Zimrin, A.J. Hart, D. Aurbach, C.V. Thompson. Enhanced synthesis of vertically aligned carbon nanotubes via in situ generation of water vapor by preheating of added oxygen. *Carbon* 50:4002-4009, 2012, <http://dx.doi.org/10.1016/j.carbon.2012.04.043>.

70. E. R. Meshot, E.A. Verploegen, M. Bedewy, S. Tawfick, A.R. Woll, K.S. Green, M. Hromalik, L.J. Koerner, H.T. Philipp, M.W. Tate, S.M. Gruner, and A.J. Hart. High-speed in situ X-ray scattering of carbon nanotube film nucleation and self-organization. *ACS Nano* 6:5091-5101, 2012, <http://dx.doi.org/10.1021/nn300758f>.
71. M. Bedewy, E.R. Meshot, A.J. Hart. Diameter-dependent kinetics of activation and deactivation in carbon nanotube population growth. *Carbon* 50(14):5106-5116, <http://dx.doi.org/10.1016/j.carbon.2012.06.051>.
72. M.R. Maschmann, G. Ehlert, S. Park, D. Mollenhauer, B. Maryuama, A.J. Hart, J.W. Baur. Visualizing strain evolution and coordinated buckling in CNT arrays by in situ digital image correlation. *Advanced Functional Materials* 22:4686-4695, 2012, <http://dx.doi.org/10.1002/adfm.201200676>.
73. O. Yaglioglu, A. Cao, A.J. Hart, R. Martens, A.H. Slocum. Wide-range tuning of microstructure and mechanical properties of carbon nanotube forests: a comparison of fixed and floating catalyst CVD techniques. *Advanced Functional Materials* 22:5028-5037, 2012, <http://dx.doi.org/10.1002/adfm.201200852>.
74. W. Lv, K. Lee, J. Li, T. Park, A.J. Hart, F. Zhang, J. Lahann. Anisotropic Janus catalysts for spatially controlled chemical reactions. *Small* 8(20):3116-3122, 2012.
75. H.W. Baac, J.G. Ok, A. Maxwell, K.T. Lee, Y.C. Chen, A.J. Hart, Z. Xu, E. Yoon, L.J. Guo. Carbon nanotube optoacoustic lens for focused ultrasound generation and high-precision targeted therapy. *Scientific Reports* 2:989, 2012, <http://dx.doi.org/10.1038/srep00989>.
76. M. De Volder, S. Tawfick, R.H. Baughman, A.J. Hart. Carbon nanotubes: present and future commercial applications. *Science* 339:535-589, 2013, <http://dx.doi.org/10.1126/science.1222453>.
77. M. De Volder, A.J. Hart. Engineering hierarchical nanostructures by elastocapillary self-assembly. *Angewandte Chemie* 52:2412-2425, 2013, <http://dx.doi.org/10.1002/anie.201205944>.
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