

## References

- [1] S. M. Sze, "Physics of semiconductor devices", 2nd ed., John-Wiley & Sons publisher, New York, pp.648-651, 1981.
- [2] R. H. Fowler and L. W. Nordheim, "Electron emission in intense field", Proc. R. SOC. A229, pp.173-175, 1928.
- [3] C. A. Spindt, I. Brodie, L. Humpnrey, and E. R. Westerberg, "Electrical properties of thin-film field emission cathodes with molybdenum cones", J. Appl. Phys., Vol.47, pp.5248-5250, 1976.
- [4] R. Meyer, "Recent development on microtips display at LETI", IVMC'91 Technical Digest, pp.6-8, 1991.
- [5] N. E. McGruer and K. Warner, "Oxidation-sharpened gated field emitter array process", IEEE Trans. Electron Devices, Vol.38, No.10, pp.488-492, 1991.
- [6] S. E. Huq and L. Chen, "Fabrication of sub 10 nm silicon tips a new approach", J. Vac. Sci. & Technol. B, Vol.13, No.6, pp.2718-2721, 1995.
- [7] D. W. Branston and D. Stephani, "Field emission from metal-coated Silicon tips", IEEE Trans. Electron Devices, Vol.38, No.10, pp. 2329-2332, 1991.
- [8] V. V. Zhirnov and E. I. Givargizov, "Field emission from silicon spikes with diamond coating", J. Vac. Sci. & Technol. B, Vol.13, No.2, pp. 418-431, 1995.
- [9] J.H. Jung and B. K. Ju, "Enhancement of electron emission efficiency and stability of molybdenum field emitter array by diamond-like carbon coating", IEEE IEDM'96, pp.293-296, 1996.
- [10] R. E. Burgess, H. Kroemer, and J. M. Honston, "Corrected value of Fowler-Norheim field emission function  $v(y)$  and  $s(y)$ ", Phys. Rev., Vol.1, No. 4, pp. 515-519, 1953.
- [11] R. B. Marcus, T. S. Ravi, T. Gmitter, H. H. Busta, J. T. Niccum, K. K. Chin, and D. Liu, "Atomically sharp silicon and metal field emitters", IEEE Trans. Electron Devices, Vol.38, pp.2289-2293, 1991.
- [12] P. Vaudaine and R. Meyer, "Microtips fluorescent display", IEEE IEDM'91, pp. 197-201, 1991.
- [13] C. Curtin, "The field emission display", International Display Research Conference pp.12-15, 1991.
- [14] C. A. Spindt, C. E. Holland, I. Brodie, J. B. Mooney, and E. R. Westerberg, "Field-emitter array applied to vacuum fluorescent displays", IEEE Trans. Electron Devices, Vol.36, No.1, pp. 225-229, 1989.
- [15] David A. Cathey, "Field emission displays", Information Display, pp. 16-20, Oct, 1995.
- [16] "Pixtech to produce color FEDs from November", News reported in Nikkei Electronics ASIA, pp.42-45, Nov., 1995.

- [17] H. G. Kosmahl, "A wide-bandwidth high-gain small size distributed amplifier with field-emission triodes (FETRODE's) for the 10 to 300 GHz frequency range", IEEE Trans. Electron Devices, Vol.36, No.11, pp. 2715-2720, 1989.
- [18] P. M. Larry, E. A. Netteshiem, Y. Goren, C. A. Spindt, and A. Rosengreen, "10 GHz turned amplifier based on the SRI thin film field emission cathode", IEEE IEDM'88, pp.522-525, 1988.
- [19] C. A. Spindt, C. E. Hollard, A. Rosengreen, and I. Brodie, "Field emitter array development for high frequency operation", J. Vac. Sci. & Technol. B, Vol.11, pp.486-500, 1993.
- [20] C. A. Spindt, "Microfabricated field emission and field ionization sources", Surface Science, Vol.266, pp.145-149, 1992.
- [21] T. H. P. Chang, D. P. Kern, "A scanning tunneling microscope controlled field emission micro probe system", J. Vac. Sci. & Technol. B, Vol.9, pp. 438-441, 1991.
- [22] H. H. Busta, J. E. Pogemiller, and B. J. Zimmerman, "The field emission triode as a displacement/process sensor", J. Micromech. Microeng., pp.45-49, 1993.
- [23] H. C. Lee and R. S. Huang, "A novel field emission array pressure sensor", IEEE Transducers- International Solid-State Sensors and Actuators, pp. 126-130, 1991.
- [24] D. G. Fink and D. Christiansen, Electronic Engineering Handbook, McGraw-Hill, New York, 1989.
- [25] H. Imura, S. Tsuida, M. Takahasi, A. Okamoto, H. Makishima, and S. Miyano, "Electron gun design for traveling wave tubes (TWTs) using a field emitter array (FEA) cathode", IEEE IEDM'97, pp.721-725, 1997.
- [26] S. Itoh, T. Watanabe, T. Yamaura, and K. Yano, "A challenge to field emission displays", in Proc. Asia Display, pp.617-620, Oct. 1995.
- [27] C. A. Spindt, I. Brodie, L. Humphrey, and E. R. Westerberg, "Physical properties of thin-film field emission cathodes with molybdenum cones", J. Appl. Phys., Vol.47, no.12, pp.5248-5263, 1976.
- [28] R. Meyer, A. Ghis, P. Rambaud, and F. Muller, "Microtips fluorescent display," in Proc. Japan Display, Sept./Oct. 1986, pp. 512-515.
- [29] S. Itoh AND M. Tanaka, "Current Status of Field-Emission Displays", PROCEEDINGS OF THE IEEE, Vol.90, No.4, pp.230-235, APRIL 2002.
- [30] M. Ding, H. Kim, and A. I. Akinwande" Highly Uniform and Low Turn-On Voltage Si Field Emitter Arrays Fabricated Using Chemical Mechanical Polishing", IEEE ELECTRON DEVICE LETTERS, Vol.21, No.2, pp. 240-245, FEBRUARY 2000.
- [31] X. Xu and G. R. Brandes, "A method for fabricating large-area, patterned, carbon nanotube field emitters", Appl. Phys. Lett., Vol.74, pp.2549-2554, 1999.

- [32] A. M. Rao, D. Jacques, and R. C. Haddon, "In situ-grown carbon nanotube arrays with excellent field emission characteristics", *Appl. Phys. Lett.*, Vol.76, pp.3813-3816, 2000.
- [33] H. Murakami, M. Hirakawa, C. Tanaka, and H. Yamakawa, "Field emission from well-aligned, patterned, carbon nanotube emitters", *Appl. Phys. Lett.*, Vol. 76, pp.1176-1180, 2000.
- [34] W. B. Choi, D. S. Chung, J. H. Kang, H. Y. Kim, Y. W. Jin, I. T. Han, Y. H. Lee, J. E. Jung, N. S. Lee, G. S. Park, and J. M. Kim, "Fully sealed, high-brightness carbon-nanotube field-emission display", *Appl. Phys. Lett.*, Vol.75, pp. 3129-3132, 1999.
- [35] [http://www.samsungsdi.co.kr/contents/en/tech/disClass\\_02\\_01.html](http://www.samsungsdi.co.kr/contents/en/tech/disClass_02_01.html)
- [36] <http://www.nanoelectronics.jp>
- [37] *Vacuum Microelectronics*. Edited by Wei Zhu Copyright c \_2001 John Wiley & Sons, Inc.
- [38] <http://pixtech.com>
- [39] A. F. Bernhardt, R. J. Contolini, A. F. Jankowski, V. Liberman, J. D. Morse, R. G. Musket, R. Barton, J. Macaulay and C. Spindt, *J. Vac. Sci. Technol.*, B, Vol.18, pp.1212-1215, 2000.
- [40] Pictures from K. L. Jensen, "Theory and simulation of field emission from microstructures", <http://other.nrl.navy.mil/CREBWorkShop/Jensen.pdf>. Individual sources: Candescent/ Sony DVD player — Chris Curtin; Motorola 15" FED — Alec Talin; NG/SRI TWT — David Whaley.
- [41] W. I. Milne, K. B. K. Teo, G. A. J. Amaratunga, P. Legagneux, L. Gangloff, J.-P. Schnell, V. Semet, V. Thien Binh and O. Groeningd. "Carbon nanotubes as field emission sources", *J. Mater. Chem.*, Vol.14, pp.933–943, 2003.
- [42] S. Iijima, "Helical microtubules of graphitic carbon", *Nature*, Vol.354, pp.56-63, 1991.
- [43] M. S. Dresselhaus, G. Dresselhaus, K. Sugihara, L. I. Spain, and H. A. Goldberg, "Graphite fibers and filaments", Springer-Verlag, New York, 1998.
- [44] P. M. Ajayan, "Nanotubes from carbon", *Chem. Rev.*, Vol.99, pp.1787-1791, 1999.
- [45] S. Iijima and T. Ichihashi, "Single-shell carbon nanotubes of 1-nm diameter", *Nature*, Vol.363, pp.603-607, 1993.
- [46] D. S. Bethune, C. H. Kiang, M. S. de Vries, G. Gorman, R. Savoy, J. Vazquez, and R. Beyers, "Cobalt-catalyzed growth of carbon nanotubes with single-atomic-layer walls," *Nature*, Vol.363, pp.605-610, 1993. M. S. Dresselhaus, G. Dresselhaus, and P. C. Eklund, "Science of fullerenes and carbon nanotubes," Academic Press, New York, 1996.
- [47] R. Saito, M. S. Dresselhaus, and G. Dresselhaus, "Physical properties of carbon

- nanotubes”, World Scientific, New York, 1998.
- [48] C. H. Olk and J. P. Heremans, “Scanning tunneling spectroscopy of carbon nanotubes”, *J. Mater. Res.*, Vol.9, pp.259-263, 1994.
- [49] D. L. Carroll, P. Redlich, P. M. Ajayan, J. C. Charlier, X. Blasé, A. De Vita, and R. Car, “Electronic structure and localized states at carbon nanotube tips”, *Phys. Rev. Lett.*, Vol.78, pp.2811-2815, 1997.
- [50] D. L. Carroll, X. Blasé, J. C. Charlier, S. Curran, P. Redlich, P. M. Ajayan, S. Roth, and M. Ruhle, “Effects of nanodomain formation on the electronic structure of doped carbon nanotubes”, *Phys. Rev. Lett.*, Vol.81, pp. 2332-2337, 1998.
- [51] Erik T. Thostenson, Zhifeng Ren, Tsu-Wei Chou, “Advances in the science and technology of carbon nanotubes and their composites: a review”, *Composites Science and Technology*, Vol.61, pp.1899–1912, 2001.
- [52] Oleg A. Nerushev, Martin Sveningsson, Lena K. L. Falk and Frank Rohmund, “Carbon nanotube films obtained by thermal chemical vapor Deposition”, *J. Mater. Chem.*, Vol.11, pp.1122–1132, 2001.
- [53] “Carbon nanotubes (January 1998) - Physics World - PhysicsWeb.mht”, <http://physicsweb.org/articles/world/11/1/9/1/world-11-1-9-1>
- [54] R. Saito, G. Dresselhaus, M.S. Dresselhaus, “Physical Properties of Carbon Nanotubes”, Imperial College Press, London, 1998
- [55] S.B. Sinnott, R. Andrews, D. Qian, A.M. Rao, Z. Mao, E.C. Dickey, F. Derbyshire, “Model of carbon nanotube growth through chemical vapor Deposition”, *Chemical Physics Letters*, Vol.315, pp.25–30, 2001.
- [56] R.T.K. Baker, P.S. Harris, *Formation of Filamentous Carbon in Chemistry and Physics of Carbon 14*, Marcel Dekker, New York, pp.83-86, 1978.
- [57] Vladimir I. Merkulov, Anatoli V. Melechko, Michael A. Guillorn, Douglas H. Lowndes, and Michael L. Simpson, “Alignment mechanism of carbon nanofibers produced by plasma-enhanced chemical-vapor deposition”, *Applied physics letters*, Vol.79, No.18, pp.29-32, OCTOBER, 2001,
- [58] Hideki Sato, Hitoshi Takegawa, and Yahachi Saito, “Vertically aligned carbon nanotubes grown by plasma enhanced chemical vapor deposition”, *J. Vac. Sci. Technol. B* 21(6), pp.2564-2568, Nov/Dec 2003.
- [58] A.K.M. Fazle Kibria , Y.H. Mo , K.S. Nahm , M.J. Kim, “Synthesis of narrow-diameter carbon nanotubes from acetylene decomposition over an iron–nickel catalyst supported on alumina”, *Carbon* 40, pp.1241–1247, 2002.
- [59] Jong Hyung Choi , Tae Young Lee , Sun Hong Choi , Jae-Hee Han , Ji-Beom Yoo, Chong-Yun Park , Taewon Jung , Se Gi Yu , Whikun Yi , In-Taek Han , J.M. Kim, “Control of carbon nanotubes density through Ni nanoparticle formation using thermal and NH plasma treatment”, *Diamond and Related*

- Materials, Vol.12, pp.794–798, 2003.
- [60] S. Iijima, “Helical microtubules of graphitic carbon”, *Nature*, Vol.354, pp. 56-61, 1991.
- [61] S. Saito, “Carbon nanotubes for next-generation electronics devices”, *Science*, Vol.278, pp. 77-89, 1997.
- [62] S. J. Tans and C. Dekker, “Molecular transistors: potential modulations along carbon nanotubes”, *Nature*, Vol.404, pp. 834-837, 2000.
- [63] Z. H. Yuan, H. Huang, H. Y. Dang, J. E. Cao, B. H. Hu, and S. S. Fan, “Field emission property of highly ordered monodispersed carbon nanotube arrays”, *Appl. Phys. Lett.*, Vol.78, pp.3127-3131, 2001.
- [64] J. M. Lauerhaas, J. Y. Dai, A. A. Setlur, and R. P. H. Chang, “The effect of arc parameters on the growth of carbon nanotubes”, *J. Mater. Res.*, Vol.12, pp. 1536, 1997.
- [65] P. M. Ajayan, Ph. Redlich, and M. Ruhle, “Balance of graphite deposition and multi-shell carbon nanotube growth in the carbon arc-discharge”, *J. Mater. Res.*, Vol.12, pp. 244-247, 1997.
- [66] A.G. Rinzler , J. Liu , H. Dai , P. Nikolaev , C. B. Huffman , F. J. Rodriguez-Macias , P. J. Boul , A. H. Lu , D. T. Colbert , R. S. Lee , J. E. Fischer , A. M. Rao , P. C. Eklund , and R. E. Smalley, “Large-scale purification of single-wall carbon nanotubes: process, product, and characterization”, *Appl. Phys. A*, Vol.67, pp.29-33, 1998.
- [67] J. M. Mao, L. F. Sun, L. X. Qian, Z. W. Pan, B. H. Chang, W. Y. Zhou, G. Wang, and S. S. Xie, “Growth of carbon nanotubes on cobalt disilicide precipitates by chemical vapor deposition”, *Appl. Phys. Lett.*, Vol.72, pp.3297, 1998.
- [68] C. J. Lee, K. H. Son, J. Park, J. E. Yoo, Y. Huh, and J. Y. Lee, “Low temperature growth of vertically aligned carbon nanotubes by thermal chemical deposition”, *Chem. Phys. Lett.*, Vol.338, pp.113-116, 2001.
- [69] Y. C. Choi, D. J. Bae, Y. H. Lee, B. S. Lee, G. S. Park, W. B. Choi, N. S. Lee, and J. M. Kim, “Growth of carbon nanotubes by microwave plasma-enhanced chemical vapor deposition at low temperature”, *J. Vac. Sci. & Technol. A*, Vol. 18, No.4, pp. 1864-1867, 2000.
- [70] W. Lei, B. P. Wang, H. C. Yin, Y. X. Wu, and C. Z. Chang, “Influence of the fringe field and the field interaction on the emission performance of a diode emitter array”, *Nuclear Ins. And Methods in Phys. Reaerch A*, Vol.451, pp.389, 2000.
- [71] N. V. Egorov, and A. A. Almazov, “Optimization of multi-tip field emission electron source,” *Vacuum*, Vol.52, pp.295-299, 1999.
- [72] O. Groning, O. M. Kuttel, C. Emmenegger, P. Groning, and L. Schlapbach,

- “Field emission properties of carbon nanotubes”, *J. Vac. Sci. & Technol. B*, Vol.18, No.2, pp.665-669, 2000.
- [73] Yih-Ming Shyu, Franklin Chau-Nan Hong, “The effects of pre-treatment and catalyst composition on growth of carbon nanofibers at low temperature”, *Diamond and Related Materials*, Vol.10, pp.1241-1245, 2001.
- [74] Tetsutaroh Katayama, Hisashi Araki, and Katsumi Yoshino, “Multiwalled carbon nanotubes with bamboo-like structure and effects of heat treatment”, *Journal of Applied Physics*, Vol.91, No.10, pp.6675-6678, 2002.
- [75] Michael Quirk, Julian Serda, “Semiconductor Manufacturing Technology”, pp.446-448
- [76] Jean-Marc Bonard, Mirk Croci, Christian Klinke, Ralph Kurt, Olivier Noury, “Carbon nanotube films as electron field emitters”, *Carbon* 40, pp.1715-1728, 2002
- [77] L. Nilsson, O. Groening, C. Emmenegger, O. Kuettel, E. Schaller, and L. Schlapbach, “Scanning field emission from patterned carbon nanotube films”, *Applied Physics Letter*, Vol.76, No.15, 2000
- [78] NCTU 郭正次 教授 授課文稿
- [79] Jong Hyung Choi, Sun Hong Choi, Jae-Hee Han, Ji-Beom Yoo, and Chong Yun Park, “Enhanced electron emission from carbon nanotubes through density control using plasma treatment of catalyst metal”, *Journal of Applied Physics*, Vol.94, No.1, pp.487-490, 2003.
- [80] Do Hyung Kim, Hoon Sil Jang, Chang Duk Kim, Dong Soo Cho, “Enhancement of the field emission of carbon nanotubes straightened by application of argon ion irradiation”, *Chemical Physics Letter*, Vol.378, pp.232-237, 2003.
- [81] Akio Kawabata, Keishin Ota, Toshiyuki Matuura, Masao Urayama, Hirohiko Murakami, and Eili Kita, “Improvement of fields emission characteristics by fabricating aligned open-edged particle-free carbon nanotubes”, *Jpn. J. Appl. Phys.* Vol.41, pp.1363-1365, 2002
- [82] Kyung Soo Ahn, June Sik Kim, Chae Ok Kim, Jin Pyo Hong, “Non-reactive rf treatment of multiwall carbon nanotube with inert argon plasma for enhanced field emission”, *Carbon*, Vol.41, pp.2481-2485, 2003
- [83] Yuming Liu, Liang Liu, Peng Liu, Leimei Sheng, Shoushan, “Plasma etching carbon nanotube arrays and the field emission properties”, *Diamond and related materials*, Vol.13, pp.1609-1613, 2004

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Effects of High Density plasma Post Treatments on  
the Characteristics of Carbon Nanotube Field  
Emission Displays