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Micro and Nanodevices, Manufacturability, and Reliability

Titu-Marius I. BĂJENESCU
C. F. C., La Conversion, Switzerland
tmbajenesco@bluewin.ch

Abstract
The paper takes a fresh look at lessons learned and where things stand today, along with prospects for a bright future. The MEMS industry is currently at a much more vulnerable position than it appears, regardless of how wonderful its future may look like. A full understanding of the physics and statistics of the defect generation is required to investigate the ultimate reliability limitations for nanodevices. Biggest challenge: cost effective, high volume production.

Keywords: component, carbon nanotubes (CNT), fabrication, manufacturability, failure analysis, EHS, MEMS, MEOMS, nanodevices, NEMS, packaging, reliability.

References:

[1] [AMA 02] Amakawa, S. K., Nakazato, and H. Mizuta, „A new approach to failure analysis and yield enhancement of very large integrated systems,“ Proceedings of 32th European Solid-State Device Research Conference, September 2002, Firenze, pp. 147-150.
[2] [BAB 10] Băjenescu, T. I., and M. Bâzu, Component Reliability for Electronic Systems, Artech House, Boston and London, 2010.
[3] [BAE 07] Bae, S. J. et al., „Statistical models for hot electron degradation in nano-scaled MOSFET devices,? IEEE Trans. Reliability, 56, pp. 392-400.
[4] [BAJ 09] Băjenescu, T. I., „Micro Electro-Optical-Mechanical Systems (MEOMS), Microelectromecha-nical Systems (MEMS) and Reliability: Challenging Issues,“ Proceedings of 5th International Conference on Science of Electronic, Technologies of Information and Telecommunicat., SETIT 2009, March 22-26, Tunisia.
[5] [BAZ 09] Bâzu, M., et al., „Modern Procedures for Evaluating MEMS Reliability,“ Quality Assurance, Vol. XV, Nr. 57 (Jan.-March), 2009.
[6] [BHU 10] Bhushan, B., (editor), „Introduction to Nanotechnology“, in Springer Handbook of Nanotechnology, pp. 1-13, Heidelberg and New York: Springer, 2010.
[7] [BOI 99] Boit, Ch., „Can failure analysis keep pace with IC technology development?“, Proceedings of 7th IPFA ’99, Singapore.
[8] [GER 09] Gerke, R. D., MEMS Packaging, Chapter 8, http://parts.jpl.nasa.gov/docs/JPL%20PUB%2099-1H.pdf.
[9] [KAN 06] Kang, Sung-Mo, „Nanoscience and nanotechnology: Status, potential and roadmap,“ Proc. of 2006 Internat. Conf. on Communications, Circuits and Systems, Vol. 2, p. 17.
[10] [KJE 07] Kjelstrup-Hansen, J., „Integration of nanocomponents in microsystems,“ 4th Nanoworkshop at SDU (University of Southern Denmark), March 8, 2007.

[11] [MAR 07] Martin, H., and T. Daim, „Technology roadmapping through intelligence analysis: nanotechnology," Portland International Center for Management of Engineering and Technology, 5-9 August 2007, pp. 1613-1622.
[12] [MCC 08] McConachie, C. R.,"Practical issues in commercial and regulatory development of nanotechnology; the good, the bad and the ugly," Proc. of 8th IEEE Conf. on Nanotechnology 2008, Nano '08, pp. 870-873.
[13] [MUN 06] Munetoshi, F. M., M. Yasuhiro, M. Yasuhiko, Y. Fumiko, and F. Takashi, „Invisible failure analysis system by nano probing system," Hitachi Hioron, Vol. 88 (2006)., No. 3, pp. 287-290.
[14] [MYH 08] Myhailenko, S., A., S. Luby, A. M. Fischer, F. A. Ponce, and C. Tracy, „SEM characterization of silicon nanostructures: Can we meet the challenge?" Scanning, Volume 30 Issue 4 (June 2008), pp. 310-316.
[15] [ROC 01] Roco, M. C., „International strategy for nanotechnology research and development," Journal of Nanoparticle Research, Vol. 3(2001), pp. 353–360.
[16] [SHU 02] Shuttleworth, D. M., A new failure mechanism by scanning electron microscope induced electrical breakdown of tungsten windows in integrated circuit processing, Master of Science Thesis, University of Florida, 2002.
[17] http://pearton.mse.ufl.edu/theses/DavidShuttleworth.pdf
[18] [TAN 01] Tanner, D. M., and M. T. Dugger, „Wear Mechanisms in a Reliability Methodology," SPIE Proceedings, Vol. 4980, January 2001, pp. 22-40.
[19] [TRM] Technology Roadmap for MEMS, http://www.mosti.gov.my/mosti/images/pdf/MEMS.pdf+AE150
[20] [VOL 09] Voldman, S. H., ESD Failure Mechanisms and Models, Chapter 8, Chichester and New York: J. Wiley & Sons, 2009.