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# Challenges of Nanotechnologies and Some Reliability Aspects

# Titu-Marius I. BĂJENESCU

La Conversion, Switzerland tmbajenesco@bluewin.ch

#### **Abstract**

The paper take a fresh look at lessons learned from the last domain development. After a short introduction, is presented the advent of 3D Technology, the device shringing, carbon nanotubes, packaging and fabrication, critical dimensions, safety of environmental, health and safety (EHS), and the evaluation of reliability.

**Keywords:** nanotechnologies, reliability, Kaizen umbrella concept, Toyota way, lean production, innovation management

#### **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, 147-150.
- [2] [BAB 10] Băjenescu, T.I., and M. Bâzu, Component Reliability for Electronic Systems, Artech House, Boston and London, 2010.
- [3] [BAJ] Băjenescu, T.I., "Micro Electro-Optical-Mechanical Systems (MEOMS), Microelectromechanical Systems (MEMS) and Reliability: Challenging Issues," Proceedings of 5th International Conference on Science of Electronic, Technologies of Information and Telecommunications, SETIT 2009, March 22-26, Tunisia.
- [4] Băjenescu, T.I., "Nano-electronics and Reliability," EEA vol. 59 (2011), issue 4, 9-14.
- [5] Băjenescu, T.I., "Challenges in Nanotechnologies and Manufacturing Processes," EEA vol. 60 (2012), issue 1, 75-79.
- [6] Băjenescu, T.I., "Micro-comutatoare RF MEMS: fiabilitate, moduri și mecanisme de defectare," Meridian ingineresc, Nr. 3(2013), 11-17.
- [7] Băjenescu, T.I., "Grand Challenges and Relevant Failure Mechanisms of Nanoelectronic Devices," EEA Vol. 62 (2014), issue 2, 39-44.
- [8] Băjenescu, T.I., Zuverlässigkeit elektronischer Bauelemente, Wiley VCH, Weinheim, 2017.
- [9] [BAZ 09] Bâzu, M., et al., "Modern Procedures for Evaluating MEMS Reliability," Quality Assurance, Vol. XV, Nr. 57 (Jan.-March), 2009.
- [10] [BHU 10] Bhushan, B., (editor), "Introduction to Nanotechnology", in Springer Handbook of Nanotechnology, pp. 1-13, Heidelberg and New York: Springer, 2010.
- [11] [BOI 99] Boit, Ch., "Can failure analysis keep pace with IC technology development?", Proceedings of 7th IPFA '99, Singapore.
- [12] [GER 09] Gerke, R.D., MEMS Packaging, Chapter 8, http://parts.jpl.nasa.gov/docs/JPL%20PUB%2099-1H.pdf.

### Asigurarea Calitatii - Quality Assurance, ISSN 1224-5410 Vol. XXIII, Issue 90, April-June 2017 Pages 26-34

- [13] [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.
- [14] [KJE 07] Kjelstrup-Hansen, J., "Integration of nanocomponents in microsystems," 4th Nanoworkshop at SDU (University of Southern Denmark), March 8, 2007.
- [15] [MAR 07] Martin, H., and T. Daim, "Technology roadmapping through intelligence analysis: nanotechnology," Portland Internat. Center for Management of Engineering and Technology, 5-9 August 2007, 1613-1622.
- [16] [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, 870-873.
- [17] [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, 287-290.
- [18] [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), 310-316.
- [19] [ROC 01] Roco, M.C., "International strategy for nanotechnology research and development," Journal of Nanoparticle Research, vol.3, (2001) 353–360.
- [20] [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. http://pearton.mse.ufl.edu/theses/DavidShuttleworth.pdf
- [21] [TAN 01] Tanner, D.M., and M.T. Dugger, "Wear Mechanisms in a Reliability Methodology," SPIE Proceedings, Vol. 4980, January 2001, 22-40.
- [22] [TRM] Technology Roadmap for MEMS, http://www.mosti.gov.my/mosti/images/pdf/MEMS.pdf.
- [23] [VOL 09] Voldman, S.H., ESD Failure Mechanisms and Models, Chapter 8, Chichester and New York: J. Wiley & Sons, 2009.