

## **Gregory C. Munie, Ph.D.**

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### **Highlights of Qualifications**

30 years experience in materials development and testing, electronics assembly, reliability and design

- Broad technical experience in chemistry, materials, experimental design and testing with hands on work in analytical, clinical and polymer chemistry, high modulus fiber development and electronics processing
- Extensive experience in technology road mapping/technology forecasting for the electronics industry
- Proven organizational skills involving cross functional/business unit/company teams dealing with issues such as data collection and interpretation, failure mode analysis, reliability testing, new process introduction, product development, environmental issues and standards development
- Proven teaching and communications skills honed through multiple public and internal presentations. Experienced in development and presentation of training seminars on electronics design and assembly, the environment, technology roadmaps and materials

### **Education**

**1980 Ph.D., Physical Chemistry:** University of Illinois, Urbana, IL

**1980 M.S., Physical Chemistry:** University of Illinois, Urbana, IL

**1971 B.S., Chemistry:** St. Procopius College (now Benedictine University), Lisle, IL

**Ph.D. Graduate Thesis:** Crosslinking and Entanglement Effects in Polybutadiene: A study of the relation between molecular structure and bulk elastomeric properties

### **Publications**

1. G.C.Munie (for the IPC Solder Products Value Council), "Take Action Limits (TAL) for SAC305 Lead Free Soldering Processes Utilizing Solder Baths/Pots", IPC Technical White Paper, January 2010
2. G.C.Munie, L.J.Turbini "Fluxes and Cleaning", in Printed Circuits Handbook, 6th edition, C.F.Combs Jr. editor, McGraw Hill, New York 2007
3. G.Munie, A.Hilvers, P.Lotosky, K.Seelig, J.Vivari, G.Wenger "To Void or Not to Void", SMT Magazine, Volume 19, Number 1, January 2006
4. G.Munie (editor) for the IPC SPVC, "The Effect of Voiding in Solder Interconnections formed from Lead Free Solder Pastes with Alloys of Tin, Silver and Copper", IPC SPVC WP-009, January 2006

5. G.Munie (editor) for the IPC SPVC, "Round Robin Testing and Analysis of Lead Free Solder Pastes with Alloys of Tin, Silver and Copper, Final Report", IPC SPVC WP-008, May 2005
6. G.Munie (editor) for the IPC SPVC, "Phase II Down Select and Assembly Report, Round Robin Testing and Analysis of Lead Free Solder Pastes with Alloys of Tin, Silver and Copper", IPC SPVC WP-007, August 2004
7. G.Munie, D.R.Shirley, G.Bendzsak, L.Turbini, "Evaluating the Effect of Solder Paste Residues on RF Signals Between 5 and 10 GHz", Proceedings of Materials, Science and Technology 2003, November 9-12, 2003, Chicago, IL
8. G.Munie, D.R.Shirley, G.Bendzsak, L.Turbini, "Evaluating the Effect of Solder Paste Residues on RF Signals Between 5 and 10 GHz", Proceedings of Surface Mount Technology International, September 21-25, 2003, Rosemont, IL
9. G.Munie (editor) for the IPC Solder Products Value Council (SPVC), "Round Robin Testing and Analysis, Lead Free Alloys of Tin, Silver and Copper", IPC SPVC WP-006, July 2003
10. G.C.Munie (for the Surface Mount Council), "SMC101: EMS Providers", PC Fab, April 2001
11. G.C.Munie, L.Turbini, D.Berneir, J.Gamalski, D.W.Bergman, "Examining the Environmental Impact of Lead-Free Soldering Alternatives", IEEE Transactions on Electronics Packaging Manufacturing, 24, 1, pp 4 – 9, January 2001
12. G.C.Munie, "Telecommunications and PWBs", IEEE Components and Packaging Technologies, Volume 23, Number 4, December 2000)
13. G.C.Munie, "Telecommunications and PWBs", CircuiTree, 13, 10, pp 98 - 106, October 2000
14. G.C.Munie, L.Turbini, D.Berneir, J.Gamalski, D.W.Bergman, " Doing What's Right Environmentally in Electronics", Future EMS, Issue 3, pp 45-46, 2000
15. G.C.Munie, L.Turbini, D.Berneir, J.Gamalski, D.W.Bergman, "Assessing the Environmental Impact of Lead Free Soldering ", Proceedings of Electronics Goes Green 2000, September 11-13, 2000, Berlin, Germany
16. G.C.Munie, L.Turbini, D.Berneir, J.Gamalski, D.W.Bergman, "Examining the Environmental Impact of Lead Free Soldering Alternatives", Proceedings of IEEE International Symposium on Electronics and the Environment, San Francisco, May 2000.
17. G.C.Munie, L.Turbini, D.Berneir, J.Gamalski, D.W.Bergman, "Environmental Issues In Electronics Assembly", Proceedings of Surface Mount Technology International 1999, San Jose, CA, September 12 - 13, 1999 (And also in The Journal of Surface Mount Technology, 13, 1, pp 15 - 20, January 2000)
18. G.C.Munie, L.Hymes, "A Review of Fluxless Soldering Techniques", Proceedings of NEPCON West, 1998
19. G.C.Munie for the Surface Mount Council, "Technology Vision 2010", Proceedings of Surface Mount International 1998, San Jose, CA, August 23-27, 1998
20. G.C.Munie, D.L.Lewis, M.Notis, D.M.Noctor, "Solderability and Surface Mount (SM) Solder Joint Shape Predictions", Proceedings of the Materials Society Annual Meeting, February 9 - 13, 1997, Orlando, FL
21. G.C.Munie, T.E.Graedel, B.K.Stolte, G.C.Wightman, "Applying the DFE Toolkit to an Electronic Switch", Proceedings of the IEEE Symposium on Electronics and the Environment, IEEE, Piscataway, NJ, 1996
22. G.C.Munie, B.K.Stolte, G.C.Wightman, "Design for Environment Attributes of the AT&T 5ESS© Switch", AT&T Technical Journal Volume 74, Number 6, pp 102 - 112, November/December 1995

23. G.C.Munie, T.I.Ejim, S.A.Gahr, A. Holliday, R.J.Lockwood, G.P.Tashjian, "Designed Experiment to Evaluate Assembly Defect Drivers for PBGA Packages", Proceedings of Surface Mount International 1995, San Jose, CA, August 28 - 31, 1995
24. G.C.Munie, E.A.Heiser, P.C.Moy, D.A.Machusak, G.M.Wenger, "Development of AT&T's Internal Solderability Standard: Building on External Specifications and Assembly Experience", Proceedings of Surface Mount International 1995, San Jose, CA, August 28 - 31, 1995
25. G.C.Munie, G.M.Wenger, D.A.Machusak, D.M.Noctor, T.I.Ejim, "Effect of Solderability on Assembly Yield and Reliability", Proceedings of Surface Mount International 1993, San Jose, CA, August 29 - September 2, 1993
26. Munie, G.C., Prazak, R.J., "25 mil Pitch Process Development", Proceedings of the Technical Program: Surface Mount International, San Jose, CA, August 30 - September 3, 1992.
27. Munie, G.C. et al, "An Assessment of the Use of Lead in Electronics Assembly", Proceedings of the Technical Program: Surface Mount International, San Jose, CA, August 30 - September 3, 1992.
28. Munie, G.C., Dickenson, D.A., Wenger, G.W., Tashjian, G.P., Furrow, R.G., Aqueous and Semi-Aqueous Cleaning Processes, AT&T Technical Journal, Volume 71, Number 2, March/April 1992
29. Munie, G.C., Wenger, G.W., "Qualification of Terpene Cleaning", Proceedings of NEPCON West, Anaheim, CA, 1991.
30. Dodd, C.V., Munie, G.C., Morris, J.R., "High Reliability Water Soluble Flux Technology", Proceedings of Surface Mount International, San Jose, CA, August 25 - 29, 1991.
31. Chung, B.C., Munie, G.C., Wenger, G.M., Zado, F.M., "Non-Rosin Organic Residue Characterization and Simple Quantitative Detection Methods", IPC Technical Report, April 18, 1991.
32. Munie, G.C., "Aqueous Defluxing: Materials, Processes, and Equipment", in "Cleaning Printed Wiring Assemblies In Today's Environment", Les Hymes ed, Van Nostrand Reinhold, New York, NY, 1991.
33. Munie, G.C., Owens, S.L., Sharp, B.H., Wenger, G.W., "Comparison of Costs for Aqueous Processes", Proceedings of the First CFC Alternatives Conference, San Francisco, CA, June 26 - 27, 1990.
34. Dickenson, D.A., Munie, G.C., Wenger, G.W., "Terpene Hydrocarbon Cleaning of Electronic Assemblies", Electronics Manufacturing, Volume 35, 7, 1989
35. Munie, G.C., "Terpene Hydrocarbon Defluxing of Electronic Assemblies", Proceedings of the Assembly Technology Expo 1989, Chicago, Illinois, September 19 -21, 1989.
36. Munie, G.C., Wenger, G.W., "Defluxing Using Terpene Hydrocarbon Solvents", IPC Technical Presentation, TP-678, April 1988.
37. Munie, G.C., "Experience with the use of Aqueous Cleaning in the Electronics Industry", Proceedings of Conference and Trade Fair: Substitutes and Alternatives to CFCs and Halons, Washington, D.C., January 13 - 15, 1988.
38. Munie, G.C., "Experience with the use of Aqueous Cleaning in the Electronics Industry", Proceedings of the Third Annual Hazardous Materials Conference/West, Long Beach, CA, December 1 - 3, 1987.
39. Brown, D.R., Munie, G.C., Jonas, J., "Entanglements and Elasticity in Polybutadiene Networks." Journal of Polymer Science, Polymer Physics Vol. 20, 1659 (1982.)
40. Munie, G.C., Jonas, J., Rowland, T.J., "NMR Investigations of Molecular Motion in Crosslinked Polybutadiene." Journal of Polymer Science, Chemistry Vol. 18, 1061 (1980.)

41. Fury, M.A., Munie, G.C., Jonas, J., "Self-Diffusion in Compressed Liquid Pyridine." Journal of Chemical Physics Vol. 70, 1260 (1979.)
42. Munie, G.C., McMillian, J.A., "Core Polarization of Ag +2 by Electron Paramagnetic Resonance of Frozen Acid Solutions." Journal of Chemical Physics Vol. 56, 113 (1972.)

## Patents

US Patent 5,009,724, Soldering Flux and Method of its use in Fabricating and Assembling

US Patent 5,069,730, Water Soluble Soldering Paste

US Patent 4,648,547 Method and Apparatus for Achieving Reduced Component Failure during Soldering

Two Patents Pending

## Career Experience

**IPC: Association Connecting Electronics Industries**, Bannockburn, IL

***Technical Conference Director for APEX, Printed Circuit's EXPO and Designer's Summit, IPC Midwest and IPC Electronic Materials Conferences: January 2002 to Present***

- Develop the technical sessions for IPC's APEX, EXPO, Designer's Summit, Midwest and Electronic Materials Conferences and the promotional material associated with these sessions
- Edit and format the proceedings for the conferences noted above
- Manage the day to day running of the technical conference using "on the run" problem solving, and continual communication with groups ranging from speakers, technical session chairs and facility personnel to the media and CEOs of attending companies

**Kester ITW (Formerly Kester Northrup Grumman)**, Itasca, IL

***Principle Member Technology Staff: September 2001 to November 2007***

- Trouble shot a major production process and solved the problems of product consistency and performance resulting in \$20 million per year sales for Kester products
- Developed a variety of formulations for solder preforms, solder pastes, fluxes, and solder preservative coatings (two patents pending)
- Used formal training and team mentoring of Kester research staff to implement structured, statistically based experimental design and thus changed the product development process from "tweaking" existing formulas to use of basic and cross discipline chemistry and statistical evaluation in development of innovative new products
- Kester representative on both the IPC's Solder Products Value Council Technical Committee and National Roadmap for Interconnections Team, giving public written and oral exposure of Kester products and technologies

**Lucent Technologies Inc. (Formerly AT&T Bell Laboratories)**, Naperville, IL

***Distinguished Member of the Technical Staff: March 1994 to July 2001***

- Author and editor of Lucent's web-based Design for Manufacturability, Design for Test and Design for High Frequency Product databases
  - Oversaw and coordinated seventeen cross-business unit design and assembly centers in six countries in this database development
  - Used structured and hands-on experimental statistical methods to develop low defect, innovative design rules for high density electronic assemblies (Lucent Technologies Silver Award 1998)
- Authored Lucent's internally developed Design for the Environment database
  - Assessed the environmental impact of Lucent assembly processes (Arno Penzias Bell Labs President's Award 1994)
  - Member of a five person team that developed and tested a statistical tool for assessing the environmental impact of Lucent products based on design, manufacturing and use criteria (2001 EH&S Champions Award)
- Coordinator of the Switching Solutions Business Unit Manufacturing Technology Roadmap with oversight responsibilities for deployment of an annual average of \$9 million in process development funding
- AT&T/Lucent's representative on the National Roadmap for Interconnections (IPC President's Award 2001)
- Co-developer of AT&T Network System's internal component solderability standard—now part of the national standard ANSI-J-STD-002 (IPC Distinguished Committee Service Award 1998)

***Member of the Technical Staff: January 1987 to November 1994***

- Developed Design for Test/Manufacturing Standards for AT&T Switching Systems including new surface mount packaging using statistically based DOE techniques (Arno Penzias Bell Labs President's Award 1993)
- Developed novel and environmentally benign surface mount cleaning processes and solder assembly fluxes (AT&T Oklahoma City Works Engineer of the Year Award 1991, US Patents 5,009,724 and 5,069,730, 1995 AT&T Environmental Hero Award)
- Technical and environmental advisor for a cross functional team that developed a field deployable cleaning and coating process saving over \$50 million in potential customer returns (Arno Penzias Bell Labs President's Award 1988)

**Western Electric Engineering Research Center, Princeton, NJ**

***Senior Member of the Technical Staff (promoted from Member of the Technical Staff December 1985): November 1982 to January 1987***

- Developed aqueous processing system for Hybrid Circuits that improved semiconductor bonding yields five-fold and eliminated a cyanide hazardous waste source
- Developed environmentally benign detergents for use in circuit pack assembly that reduced cleaning costs by 60% and eliminated the need for cleaning with hazardous solvents (AT&T Engineering Achievement Award 1986)
- Developed a new solder assembly process for high reliability assembly (US Patent 4,648,547)

**Fiber Industries Inc., Charlotte, NC**

***Research and Development Engineer: April 1980 to August 1982***

- Supervised three technicians and coordinated the activities of ten people in pilot plant, engineering, safety, and R & D in bulk sample production for customers
- Researched basic polymerization mechanism of a new product reducing energy consumption by six-fold, and raw materials usage by eighty-fold with a projected 13% product cost reduction
- Developed winding and spinning techniques that eliminated a process step with a projected 12% product cost reduction

**Hines VA Hospital, Renal Research Laboratory, Hines, IL**

***Research Laboratory Technician (GS-5): November 1971 to May 1974***

- Analytical chemistry of trace metals, studies of membrane permeability and the clotting properties of surfaces in support of the renal dialysis research unit

References furnished upon request