

## **PUBLICATIONS/PRESENTATIONS/PATENTS**

### **Engineered Ceramics**

1. Freitag, D.W., "R&D to Market, Advancing Ceramic Market Development", Ceramics Expo, Cleveland, OH April 28-30, 2015.
2. Mandigo, G. and Freitag, D., "A Primer on CMCs", Composites Manufacturing, pp 26-29, March/April 2015
3. Freitag, D.W., et.al., Roadmap for Transparent Advanced Ceramics Sensor Windows, presented at SPIE Defense & Security Conference, Baltimore, MD, April, 2015
4. Freitag, D.W., et.al., Roadmap for Transparent Advanced Ceramics for Sensor Windows, USACA Transparent Ceramic Sensor Windows Symposium, Dayton, OH, Nov 4-5, 2014.
5. Freitag, D.W., et.al., Transparent Ceramic Armor Roadmap, USACA, 2012.
6. Mandigo, G. and Freitag, D.W., "An Industry View of Flight Structures", NSMMS, 27 June 2011.
7. Piscipo, P., Freitag, D.W., et.al., Ceramic Composite Affordability Program, USACA, 2010.
8. Freitag, D.W., "The Ceramic Composites Affordability and Producibility (CCAP) Initiative.", NSMMS, 22 June 2009
9. Freitag, D.W., "Technology Gaps for the Successful Commercialization of Advanced Ceramics", 1st International Congress on Ceramics, Toronto, 25-29 June 2006, Invited Speaker
10. Freitag, D.W., "US Ceramics Industry, Challenges and Emerging Technologies", Invited Speaker, ASM Federal Affairs Committee meeting, Washington, DC, 9 March 2005.
11. Freitag, D.W., "New Road Map for Advanced Ceramics," Invited Speaker, ACeRs Executive Management Conference, 9 December 2004.
12. Freitag, D.W., "The Advanced Ceramics Industry, an Increasingly Strategic Material", Armed Forces University, March 2004.
13. Freitag, D.W. and Hall, K., "Securing Our Future with Advanced Ceramics," 28th Annual Conference and Exposition: An International Conference on Engineering Ceramics and Structures, Cocoa Beach, FL., January, 26-29, 2004

14. Freitag, D.W., "Insertion of Advanced Ceramics – A Global Perspective", Invited Speaker, Aeromat 2002, Orlando, FL, June 9-13, 2002.
15. Freitag, D.W., "Progress and Opportunities in the Development and Application of Advanced Ceramics," Invited speaker, 14th International Symposium on Ultra-High Temperature Materials, Ube City, Japan, May 29-30, 2000.
16. Freitag, D.W. "Opportunities for Advanced Ceramic Materials in Land Based Applications in the New Millennium," Invited speaker, 24th Annual Conference and Exposition: An International Conference on Engineering Ceramics and Structures, Cocoa Beach, FL., January, 24-28, 2000
17. Freitag, D.W., "Affordability of CFCC's for Next Generation LO Designs," Have Forum, Kelley AFB, San Antonio, TX, May 11-13, 1999.
18. Freitag, D.W., Morton, D., Forsythe, E., Wood, G.L., Girolamo, H., "Military Needs for Flexible Displays", Invited Speaker, Flexible Displays and Electronics Workshop, Sponsored by the Welsh Development Agency and DTI LINK ISD, Cardiff, UK, April 7-9, 2003.
19. Freitag, D.W. "Lessons Learned from the Commercialization of C/C Composites," Invited speaker, 23rd Annual Conference and Exposition: An International Conference on Engineering Ceramics and Structures, Cocoa Beach, FL., January, 25-29, 1999
20. Freitag, D.W., "Historical Overview of C/SiC," Invited speaker, 23rd Annual Conference on Composites, Materials and Structures, Cocoa Beach, FL., January, 25-29, 1999.
21. Freitag, D.W. and Bender, G., "Composites and Polymer Science for Shipbuilding," report on the University and Business Technology Conference prepared for Office of Naval Research, April, 1998.
22. Freitag, D.W. and Richerson, D., "Opportunities for Advanced Ceramics to Meet the Needs of the Industries of the Future," Final Report to DOE, DOE/ORO 2076, December 1998.
23. Freitag, D.W. and Gray, P, "Resin Based Thermal Barrier Coatings for use on Exhaust Impinged PMC Aircraft Structure," DOD Composite Repair Workshop IV, Santa Fe NM, February 10-12, 1998
24. Freitag, D.W. and Richerson, D. " Industrial Applications of Advanced Ceramics", 22 Annual Conference on Composites, Materials and Structures, Cocoa Beach, FL., January 25-30, 1998.
25. Freitag, D.W., "Comparison of CFCC Manufacturing Cost using a Virtual Factory", 22 Annual Conference on Composites, Materials and Structures, Cocoa Beach, FL., January 25-30, 1998.

26. Freitag, D.W. and Richerson, D. "Industrial Applications of Advanced Ceramics", CFCC Working Group Meeting, Lake Tahoe, NV, 1997.
27. Freitag, D.W. and Richerson, D. "Industrial Applications of Advanced Ceramics", Industrial Applications of Ceramics, Arlington, VA, 1997.
28. Freitag, D. and Hanks, J., "Pegasus Ceramic Composite Leading Edge Airfoil Insert," ASME Turbo Expo '97, Orlando, FL, June 2-5, 1997.
29. Freitag, D. and Hanks, J., "Pegasus Ceramic Composite Leading Edge Airfoil Insert," Aeromat '97, Williamsburg, VA, May 12-15, 1997.
30. Freitag, D.W., "Ceraset, A Low Cost Alternative for LO Hot Structure," Have Forum, Low Observables Symposium, Fort Walton Beach, FL., 1997.
31. Freitag, D.W., "Affordability and Availability as Key Variables in the Material Selection Process During Product Development," 21<sup>th</sup> Annual NASA/DOD/DOE Conference on Composites, Materials and Structures, Cocoa Beach FL, January 23-25, 1996.
32. Freitag, D., Driver, H., Fresco, A., and Garnier, J., Ceramic Materials and Processing Technologies for Low Cost Expendable and Reusable Rocket Propulsion," Aeromat '96, Dayton OH, 1996.
33. Freitag, D.W., "Affordable Ceramic Matrix Composites - An Oxymoron?", Proceedings of the 20<sup>th</sup> Annual NASA/DOD/DOE Conference on Composites, Materials and Structures, Cocoa Beach FL, January 23-25, 1996.
34. Campbell, C.X., El-Rahaiby, S.K., Freitag, D.W., "Assessment of Ceramic Matrix Composite Processing Technology", Ceramics Information Analysis Center Report 4, December 1995.
35. Richardson, K.K., Freitag, D.W., and Hunn, D.L., "Barium Aluminosilicate Reinforced In-Situ with Silicon Nitride," J. Am. Ceram. Soc., 78[10] 2662-68 1995.
36. Freitag, D.W., "In-Situ Processed Si<sub>3</sub>N<sub>4</sub> Whiskers in the System BAS-Si<sub>3</sub>N<sub>4</sub>", Materials and Science Engineering, A195, 197-205, 1995.
37. Bandyopadhyay, A., Quader, S.W., Aswath, P.B., Freitag, D.W., Richardson, K.K., and Hunn, D.L., "Kinetics of In-Situ a to b - Si<sub>3</sub>N<sub>4</sub> Transformation in a Barium Aluminosilicate Matrix," Scripta Metallurgica et Materialia, 32 (9), 1417-1422, 1995.
38. Freitag, D.W., Richardson, K.K., and Hunn, D.L., "Low Cost Ceramic Radome Material for MMW Applications," 5th DoD Electromagnetic Symposium, Colorado Springs, CO., 19-21 October 1993.

39. Aly, E.I., Freitag, D.W., and Littlefield, J.E., "Effect of Fiber Coatings on Room and Elevated Temperature Mechanical Properties of Nicalon Fiber Reinforced Blackglas Ceramic Matrix Composites (CMC)," Proceedings of the Conference on Processing, Fabrication and Application of Advanced Composites, Long Beach, CA, 9-11 August 1993.
40. Freitag, D.W., Aly, E.I., and Littlefield, J.E., "Ceramic Matrix Composite Technology for Exhaust Impinged Structure," 17th Annual Conference on Composites, Material, and Structures, Cocoa Beach, FL., 10-15 January 1993.
41. Miller, D.V., Freitag, D.W., Richardson, K.K. and Hunn, D.L., "Synthesis and Properties of Barium Aluminosilicate/Si<sub>3</sub>N<sub>4</sub> Composites," 17th Annual Conference on Composites, Material, and Structures, Cocoa Beach, FL., 10-15 January 1993.
42. Freitag, D.W., Richardson, K.K. and Hunn, D.L. "In-Situ Reinforced CMC's in the System BAS-Si<sub>3</sub>N<sub>4</sub> for High Reliability Electronic Packaging," 45th Pacific Coast Regional Meeting of the American Ceramic Society, San Francisco, CA, 1-4 Nov., 1992.
43. Littlefield, J.E., Box, D.M. and Freitag, D.W., "Ceramic Matrix Composite Technology for Exhaust Impinged Structure," Second Ceramic Composites & Structural Ceramics Meeting, Sponsored by Wright Laboratory/XPN, 20-22 October, 1992.
44. Freitag, D.W., Richardson, K.K., and Hunn, D.L., "Reinforced Barium Aluminosilicate for High Temperature Electromagnetic Windows," Proceedings of the Twentieth Symposium on Electromagnetic Windows, Georgia Institute of Technology, Atlanta, GA, 15-17 Sept., 1992.
45. Freitag, D.W., Richardson, K.K., and Hunn, D.L., "Crystallization of Barium Aluminosilicate in the Presence of Silicon Nitride," Fourth Symposium on Nucleation & Crystallization in glasses and Liquids, Stone Mountain, Georgia, August 16-19, 1992.
46. Hunn, D.L. and Freitag, D.W., "Ceramic Matrix Composites for Weight Critical Hot Structure," High Temperature Composites Clinic, Sponsored by SME, Los Angeles, CA, 12-13 August, 1992.
47. Freitag, D.W., Aly, E.I., and Littlefield, J.E., "Preceramic Polymer Derived Ceramic Matrix Composites for Low Cost Aircraft Hot Structure," Aeromat, Anaheim, CA, 18-21 May, 1992.
48. Freitag, D.W., "Ceramic Matrix Composites for Aerospace Applications," Invited lecture, Department of Mechanical Engineering and Materials Science, Rice University, March, 1992.

49. Freitag, D.W., "Polymer Derived Ceramic Matrix Composites," Invited lecture, School of Materials Engineering, Purdue University, February 1992.
50. Richardson, K.K., Freitag, D.W., and Stepp, J.F., "Development of In-Situ Reinforced Barium Aluminosilicate," 94th Annual Meeting of the American Ceramic Society, Minneapolis, MN, 12-16 April, 1992.
51. Richardson, K.K., Freitag, D.W., and Hunn, D.L., "Development and Characterization of In-Situ Reinforced Barium Aluminosilicate for MM-Wavelength Radome Applications," Proceedings of the 16th Annual Conf. on Composites, Materials, and Structures, Cocoa Beach, FL. 12-15 January, 1992.
52. Freitag, D.W., Richardson, K.K., and Hunn, D.L., "Barium Aluminosilicate Composites for Hypersonic Radome Applications," Proceedings of the 4th DoD Electromagnetic Windows Symposium, Monterey, CA, 19-21 November 1991
53. Freitag, D.W. "Polymer Derived Ceramic Matrix Composites," Invited Speaker, Clinic on High Temperature Composites, Sponsored by SME, Los Angeles, CA, August 14-15, (1991).
54. Freitag, D.W. and Aly, E.I., "Ceramic Matrix Composites by Polymer Pyrolysis as a Method for Manufacturing Large Aerospace Hot Structure," Invited Speaker, DoD/CIAC Workshop on Ceramic Matrix Composites, Alexandria, VA, August 1-4, (1991).
55. Hunn, D.H. and Freitag, D.W., "Ceramic Matrix Composites for Weight Critical Hot Structure," Invited paper, Invited Speaker, 50th Annual Int. Conf. of Society of Allied Weight Engineers, San Diego, Ca, May 20-22, (1991).
56. Freitag, D.W., "Toughened Ceramic Fastener Development," Final Report to General Dynamics, Contract #4152350, March 1991.
57. Littlefield, J.E., Box, D.M., and Freitag, D.W., "Ceramic Matrix Composite Exhaust System," Invited speaker at First Ceramic Composites & Structural Ceramics Meeting, Sponsored by Wright Laboratory/XPN, 19-20 March, 1991.
58. Freitag, D.W., Aly, E.I., Hunn, D.L., and Littlefield, J.E., "Lightweight Ceramic Composite Hot Structure," Proceedings of the 15th Annual Conference on Composites, Materials, and Structures, Cocoa Beach, FL, January 16-18, 1991.
59. Richardson, K.K. and Freitag, D.W., "Mechanical Properties of Hot Pressed SiC Platelet Reinforced MoSi<sub>2</sub>," Proceedings of the 15th Annual Conference on Composites and Advanced Ceramics, Cocoa Beach, FL, January 13-16, 1991.
60. Freitag, D.W. and Stepp, J.F., "Discontinuously Reinforced Yttria as a Structural Ceramic," Ceramic Science and Technology Congress, Symposium on Composites, Orlando, FL., November 12-15, 1990

61. Freitag, D.W., Richardson, K.K., and Hunn, D.L., "Ceramic Composites for Mechanical Fastening at High Temperatures," Invited Speaker at NASA Langley Workshop on High Temperature Refractory Composites Fasteners, Orlando, FL., October 31, 1990
62. Freitag, D.W., Hunn, D.L., and Littlefield, J.E., "Ceramic Matrix Composites for Weight Critical Hot Structure," Invited Speaker at 16th Annual Texas Chapter Regional Conference of the Society Allied Weight Engineers, Arlington, TX, September 21-22, 1990.
63. Freitag, D.W. and Stepp, J.F., "Sintering Phenomena Associated with Whisker Reinforced Silicon Nitride," 92nd Annual ACeS Meeting, Dallas, TX, April 22-26, (1990).
64. Richardson, K.K. and Freitag, D.W., "Thermal and Chemical Stability of Hot Pressed SiC Whisker Reinforced SrZrO<sub>3</sub>," 92nd Annual ACeS Meeting, Dallas, TX, April 22-26, (1990).
65. Freitag, D.W. and Hunn, D.L., "Ceramic Composites as a Lightweight Alternative for High Temperature Mechanical Fasteners," Invited paper, 49th Annual Int. Conf. of Society of Allied Weight Engineers, Mesa, AZ, May 21-23, (1990).
66. Freitag, D.W. and Hunn, D.L., "Ceramic Composites for High Temperature Mechanical Fastening," Proceedings of the 14th Annual Conference on Composites and Advanced Ceramics, Cocoa Beach, FL, January 17- 19, (1990).
67. Freitag, D.W., "Lightweight Fasteners for High Temperature Aerospace Applications," 15th Annual Texas Chapter Regional Conference of the Allied Weight Engineers, Fort Worth, TX September 22-23 (1989). Received Best Presentation Award.
68. Freitag, D.W., "Oxygen Diffusion in SrHfO<sub>3</sub> for use in Ceramic Matrix Composites at Ultrahigh Temperatures," WRDC-TR-89-4029, Wright Patterson Air Force Base, OH, 1989.
69. Freitag, D.W. and Richardson, K.K., "Oxygen Diffusion in SrHfO<sub>3</sub> and YS-HFO<sub>2</sub>," 91st ACeS Annual Meeting, Indianapolis, IN, April 24-27 (1989).
70. Freitag, D.W. and Richardson, K.K., "Thermal Stability of SrHfO<sub>3</sub> and YS-HFO<sub>2</sub>," 91st ACeS Annual Meeting, Indianapolis, IN, April 24-27 (1989).
71. Freitag, D.W. "Whisker Reinforced Ceramic Matrix Composites, An Overview," Invited seminar lecture, Rutgers University. 1988.
72. Freitag, D.W. "Whisker Reinforced Ceramic Matrix Composites, An Overview," Invited seminar lecture, Ohio State University. 1988.

73. Freitag, D.W., "Effect of Whisker Particulate Concentration on the Mechanical Properties of Whisker Reinforced Ceramic Composites," Proceedings of the 19th International SAMPE Technical Conference, Arlington, VA, October 1-15 (1987).
74. Freitag, D.W. and Peterson, D.H., "High Aspect Ratio Whisker Reinforced Ceramics," 10th Annual Conference on Composites and Advanced Ceramic Materials, Cocoa Beach, FL, January, (1986).

### **3D Printing**

1. Freitag, D., Wohlers, T., Philipp, T., "Rapid Prototyping: State of the Art" DTIC ADA431535, 2003.
2. Knight, R., Wright, J., Beaman, J., and Freitag, D., "Prototype Functional Metal Parts by the SLS/HIP Process," 6th European Conference on Rapid Prototyping & Manufacturing, Nottingham, England, 1997.
3. Knight, R., Wright, J., Beaman, J., and Freitag, D., "Metal Processing Using Selective Laser Sintering and Hot Isostatic Pressing," Proceedings of Solid Freeform Fabrication, Sept., 349-353, 1996.

### **PATENTS**

1. Freitag, D., Beaman, J., Bourell, D., "Laser Directed Fabrication of Full-Density Metal Articles Using Hot Isostatic Pressing," Patent 5,640,667, June 17, 1997. (licensed by 3DSystems)
2. Hunn, D.L., Freitag, D.W., Wood, J.R., and Keough, S.M., "Radome with Secondary Heat Shield." Patent Number 5,691,736, November 25, 1997.
3. Freitag, D.W. and Richardson, K.K., "In-situ Reinforced Barium Aluminosilicate." Patent Number 5,358,912, October 25, 1994. (In production for PAC-3 by Ceradyne)
4. Freitag, D.W., "Method for Producing Structures by Isostatic Compression." Patent Number 4,931,241, June 5, 1990.
5. Freitag, D.W., "Method for the Production of Reinforced Composites." Patent Number 4,840,763, June 20, 1989.
6. Aly, E.I., Freitag, D.W., Miller, D.V., Richardson, K.K., "Method for Applying Textured Ceramic Surfaces on Ceramic Matrix Composites." Patent applied for December 1993. Secrecy order in effect.
7. Aly, E.I., Freitag, D.W., "Method for Fabricating a Polymer Derived Fiber Reinforced Ceramic Matrix Composite Honeycomb Core Structure." Patent applied for August 1991. Secrecy order in effect.