

Richard L. Lehman
Professor of Materials Science and Engineering
Rutgers University

Curriculum Vitae

Academic Degrees

PhD	Ceramic Science	Rutgers University
	Thesis: <i>Acid Corrosion Mechanisms for Lead-Containing Silicate Glasses</i>	
MS	Ceramic Science	Rutgers University
BS	Ceramic Science	Rutgers University (summa cum laude)

Professional Employment

Rutgers University, Piscataway, NJ

Department of Materials Science and Engineering

Professor	July 1996 - Present
Associate Chair, Materials Science and Engineering	February 2009 – Present
Director, AMIPP Polymer Center	January 2002 - Present

Conduct basic and applied research in polymers, glass, and ceramic materials. Direct and coordinate interdisciplinary research in polymer materials. Participate in graduate and undergraduate instruction.

Employment Prior to Joining Rutgers Faculty in 1982.

Manager, Commercial/Technical Development	FMC Corporation, Philadelphia, PA Chemical Group Headquarters
Marketing Product Manager, Polymer Additives	FMC Corporation, Philadelphia, PA Chemical Group Headquarters
Group Leader and Research Engineer	FMC Corporation, Philadelphia, PA R&D Center, Princeton, NJ
Glass Technologist	Johns-Manville Fiberglass, Toledo R&D Center

Teaching

Courses recently taught:

635:201 Chemistry for Engineers
635:312 Glass Engineering
635:361 Polymer Engineering
150:437 Glass Pkg. Engineering
150:419 Thermodynamics
150:312 Glass Engineering
440:125 Intro to Fortran
440:127 Intro to Computing
150:304 Ceramic Compositions
150:304 Ceramic Compositions Laboratory
150:413 Ceramic Engineering Venture Analysis
150:505 Advanced Glass
150:491 Special Problems in Ceramics

Independent Study Supervision**Undergraduate****Students Directed in Undergraduate Studies Since 1996**

	Student	Research Topic	Activity	Year
1.	Samantha Parillo	Properties of Polymers	Research assistant, AMIPP Center	2009
2.	Kendall Mills	Trimethylene Phthalate Polymer Composites	Senior Thesis (with Prof. Nosker)	2009
3.	Youn Lee	Optical properties of glass packaging materials	Special Problems and Senior Thesis	2007
4.	Nancy Twu	Melt oriented fiber/polymer composites	Special Problems and Senior Thesis	2006-2007
5.	Meriam Youseff	Nano Indentation Analysis of PLA/PMMA Blends	Senior Thesis	2005
6.	Hebah Gebale	DMA Analysis of PLA/PMMA Blends	Senior Thesis	2005
7.	Payal Patel	Raman Analysis of PLA/PMMA Blends	Senior Thesis	2005
8.	Payal Patel	PLA/PMMA biomaterials via immiscible polymer processing	Research assistant, AMIPP Center	2004
9.	Mike Gonzales	Development of flame spray processing methods for functional polymer coatings	Research assistant, AMIPP Center	2004
10.	Seth Barringer	Effect of Batch Redox Number on the Color of Amber Soda Lime Glass Melts	Senior Thesis, Department of Ceramics, Rutgers University	2004
11.	Tony Fast	Characterization of Polymer Composites	Research assistant, AMIPP Center [with T. Tsakalakos]	2003
12.	Christina Liu	Immiscible polymers as functional flame spray coating hosts	Research assistant, AMIPP Center	2003
13.	Arpit Shah	Digital library development	Research assistant, AMIPP Center [with H. Crawford]	2003
14.	Adam Greenberg	Advanced functional materials from immiscible polymer blends	Research assistant, AMIPP Center [with T. Tsakalakos]	2003
15.	Paul Wenzel	Flexural properties of PS/PE composites by micro flexural testing	Research assistant, AMIPP Center	2003

16.	Aditi Paliwal	Extrusion of styrene composites	Research assistant, AMIPP Center	2003
17.	Manuel DaSilva	PMMA and PMMA composite development and characterization	Research assistant, AMIPP Center [with T. Tsakalakos]	2002
18.	Tina Ngyen	Immiscible polymer processing – laboratory establishment	Research assistant, AMIPP Center	2002
19.	Jon Allen	Identification and Modeling of Co-continuous Phase Morphologies in Immiscible Polymer Blends"	Senior Thesis, Department of Ceramics, Rutgers University	2002
20.	Simon Koster	Identification and Modeling of Co-continuous Phase Morphologies in Immiscible Polymer Blends"	Senior Thesis, Department of Ceramics, Rutgers University	2002
21.	Kim Hill	The Effect of Selected Processing Variables on Color Formation in Praseodymium-doped Zircon Pigments	Senior Thesis, Department of Ceramics, Rutgers University	1999
22.	Donna Heidorn	Radiation resistant CRT Glass Coatings	Senior Thesis, Department of Ceramics, Rutgers University	1998
23.	Dan Strange	Surface Modification of Lead Crystal Glasses	Senior Thesis, Department of Ceramics, Alfred University	1997
24.	Mee Han	Glaze/Body Interface Reactions	Senior Thesis, Department of Ceramics, Rutgers University	1996

Masters and Doctoral Theses

Students Directed to Degree by the Professor Lehman

1.	Giorgiana Giancola	Melt processing of polymer composites from micro and nano powder precursors	PhD. Thesis, Department of Materials Science and Engineering	2012e
2.	Wantinee Viratyaporn	PMMA nanoparticle composites – Raman Spectroscopy of the Interphase.	PhD. Thesis, Department of Materials Science and Engineering	2009e
3.	Wantinee Viratyaporn	Impact resistance of multiphase polymer blends	MS. Thesis, Department of Materials Science and Engineering	2008
4.	Kim Le	Multiphase Blends from Poly(L-lactide) and Poly(methyl methacrylate)	Ph.D. Thesis, Department of Ceramics, Rutgers University	2007

5.	Jayant Joshi	Selected Physical Characteristics of Polystyrene/High Density Polyethylene Composites Prepared from Virgin and Recycled Materials	Ph.D. Thesis, Department of Ceramics, Rutgers University	2007
6.	Vivek Thirtha	Glass Transition Phenomena In Melt-Processed Polystyrene/Polypropylene Blends	Ph.D. Thesis, Department of Ceramics, Rutgers University	2006
7.	Chris Haines	Photosensitivity of Silicates at 193 nm	Ph.D, Department of Ceramics, Rutgers University [co-advised with George Sigel]	2003
8.	Namit Sinha	Localized thermal processing of optical structures.	MS, Department of Ceramics, Rutgers University	2002
9.	D. Wong	Low T _g glass materials for whiteware repairs	MS Thesis, Department of Ceramics, Rutgers University	1999
10.	D. Blackhurst	Gas Solubility in Glass and the Processing of Hollow Glass Spheres	MS Thesis, Department of Ceramics, Rutgers University	1998
11.	S. Toffoli	Optical and Electro-Optic Strain Sensors in Continuous Filament Ceramic Matrix Fiber Composites	Ph.D. Thesis, Department of Ceramics, Rutgers University	1997
12.	J. Lie	Hydrogen Interactions with Vitreous Silica and the Resulting Effects on EPR Active Defect Sites and UV Absorption Spectra	Ph.D. Thesis, Department of Ceramics, Rutgers University	1995
13.	Y. Umezu	Fiber Failure Mechanisms in Ceramic Matrix Fiber Composites	Ph.D. Thesis, Department of Ceramics, Rutgers University	1995
14.	S. Kannan [co-director, G. H. Sigel, director]	Effect of UV Radiation on Defect Populations in Vitreous Silica as Characterized by EPR and Optical Spectra	Ph.D. Thesis, Department of Ceramics, Rutgers University	1994
15.	Z. Abdul-Walid	Processing and Characterization of Doped Silicate Optical Glasses	MS Thesis, Department of Ceramics, Rutgers University	1994
16.	R. Zolandz	Mechanical Behavior and Crack healing in Fluoride Glass	MS Thesis, Department of Ceramics, Rutgers University	1992
17.	L. A. Quesada	Reformulation and Properties of Sanitaryware Bodies	MS Thesis, Department of Ceramics, Rutgers University	1990
18.	R. C. Griffin	The Process Development and Evaluation of CVD Pyrolytic Carbon as a Coating on Ceramic Fibers	M.S. Plan B Research Paper, Department of Ceramics, Rutgers University	1990

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|-----|-----------------|--|---|------|
| 19. | M. E. Mills | Draw Induced Defect/Ultraviolet Radiation Response Mechanisms in Synthetic Silica Optical Fibers | Ph.D. Thesis, Department of Ceramics, Rutgers University | 1989 |
| 20. | R. E. Hill | Low Temperature Crack Healing in Heavy Metal Fluoride Glass | MS Thesis, Department of Ceramics, Rutgers University | 1989 |
| 21. | C. Zern | Mechanical Properties of Discrete Fiber Interfaces in SiC Fiber/Glass Matrix Composites | Ph.D. Thesis, Department of Ceramics, Rutgers University | 1988 |
| 22. | F. A. Kuchinski | Corrosion Behavior of Borosilicate Nuclear Waste Glass in the Presence of Reactive Lead Species | Ph.D. Thesis, Department of Ceramics, Rutgers University | 1988 |
| 23. | A. Gurney | Reformulation of Ceramic Whiteware Bodies to Improve Whiteness and Processing Characteristics | MS Thesis, Department of Ceramics, Rutgers University, July | 1985 |

Scholarship***Title of Dissertation***

Acid Corrosion Mechanisms for Lead-Containing Silicate Glasses, October 1976, Directed by Professor Harold T. Smyth

Published Books**(a) Books Authored and/or Edited**

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| [1] | <u>Lead Glazes for Foodware</u> , Lead Management Center, Research Triangle Park, NC | 2002 |
| [2] | <u>Introduction to Computing for Engineers, Fortran and Its Application in Engineering</u> , by Richard L. Lehman, Kendall/Hunt Publishing Company, Dubuque, Iowa, ISBN 0-7872-7402-X | 2000 |
| [3] | <u>Environmental Technologies for Glass, A Guide to Green Manufacturing</u> , Edited and with Authored Chapter Introductions by Richard L. Lehman and Yuya Umezu ^s , Ashlee Publishing, 18 E. 41 st Street, New York, NY | 1996 |
| [4] | <u>Handbook on Continuous Fiber Ceramic Composites</u> , Edited by Richard L. Lehman, Said K. El-Rahaiby, and John B. Wachtman, Jr., Ceramics Information Analysis Center, Purdue University, West Lafayette, IN 47906-1398, 600 pages. | 1995 |
| [5] | <u>Electric Melting in the Glass Industry</u> , Edited and with Authored Chapter Introductions by Richard L. Lehman, Ashlee Publishing, New York, NY, 384 pages. | 1993 |

(b) Authored Software

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| [4] | <u>Glaze Expert</u> , Richard L. Lehman, Advanced Materials Research, Inc., Rocky Hill, NJ. | 1996 |
| [5] | <u>GLS-PROP -- Properties of Silicate Glasses</u> , Richard L. Lehman, Advanced Materials Research, Inc., Rocky Hill, NJ. | 1994 |

(c) Chapters in books

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|-----|---|------|
| [3] | R. L. Lehman, "Ceramic Matrix Fiber Composites", <u>CRC Handbook of Mechanical Engineering</u> , second edition, edited by Frank Kreith, CRC Press, Inc., New York, NY | 2004 |
| [4] | R. L. Lehman and D. Strange, "Glass", <u>CRC Handbook of Mechanical Engineering</u> , second edition, edited by Frank Kreith, CRC Press, Inc., New York, NY | 2004 |
| [5] | J. Idol and R. L. Lehman, "Polymers", <u>CRC Handbook of Mechanical Engineering</u> , second edition, edited by Frank Kreith, CRC Press, Inc., New York, NY | 2004 |
| [6] | R. L. Lehman, "Adhesives", <u>CRC Handbook of Mechanical Engineering</u> , second edition, edited by Frank Kreith, CRC Press, Inc., New York, NY | 2004 |
| [7] | R. L. Lehman, "Ceramic Matrix Fiber Composites", <u>CRC Handbook of Mechanical Engineering</u> , Edited by Frank Kreith, CRC Press, Inc., New York, NY | 1998 |

- [8] R. L. Lehman and D. Strange, "Glass", **CRC Handbook of Mechanical Engineering**, Edited by Frank Kreith, CRC Press, Inc., New York, NY 1998
- [9] J. Idol and R. L. Lehman, "Polymers", **CRC Handbook of Mechanical Engineering**, Edited by Frank Kreith, CRC Press, Inc., New York, NY 1998
- [10] R. L. Lehman, "Adhesives", **CRC Handbook of Mechanical Engineering**, Edited by Frank Kreith, CRC Press, Inc., New York, NY 1998
- [6] "Acid Corrosion Behavior of Lead-Containing Silicate Glasses – Scientific Basis and International Standards", **Science of Whitewares**, Edited by V. E. Henkes, G. Y. Onoda, and W. M. Carty, The American Ceramic Society, Westerville, OH, pp. 407 - 422 1996
- [7] "Matrix Materials for Ceramic Matrix Fiber Composites", **Handbook on Continuous Fiber Ceramic Composites**, Edited by Richard L. Lehman, Said K. El-Rahaiby, and John B. Wachtman, Jr., Ceramics Information Analysis Center, Purdue University, West Lafayette, IN 47906-1398, 600 pages. 1995
- [8] "Glass and Glass Ceramic Matrix Fiber Composites", in **Handbook on Continuous Fiber Ceramic Composites**, Edited by Richard L. Lehman, Said K. El-Rahaiby, and John B. Wachtman, Jr., Ceramics Information Analysis Center, Purdue University, West Lafayette, IN 47906-1398, 600 pages. 1995
- [9] "Glass-Ceramic Matrix Fiber Composites", in **Flight-Vehicle Materials, Structure and Dynamics Technologies - Assessment and Future Directions**, edited by Ahmed K. Noor and Samuel L. Venneri, published by ASME 1992
- [10] "Overview of Ceramic Design and Process Engineering", in **Engineered Materials Handbook, Vol. IV: Ceramics & Glasses**, Volume Chairman: Dr. Samuel J. Schneider, Jr., ASM International, Materials Park, OH., pp. 29-37 1991
- [11] "Carbon Coated Alumina Fiber/Glass Matrix Composites", in **Ceramic Matrix Composites: Components, Preparation, Microstructure and Properties**, edited by R. Naslain and B. Harris, Elsevier Applied Science, London, pp. 149-164 1990
- [12] N. O. Clark and R. L. Lehman, "Whiteware Ceramics: Mineral Components", **Concise Encyclopedia of Mineral Resources**, Edited by Donald D. Carr and Norman Herz, Pergamon Press, Oxford, pp. 390 - 395 (Invited Paper) 1989
- [13] "Ceramic Matrix Fiber Composites", in **Structural Ceramics**, edited by J. B. Wachtman, Volume 29 of Treatise on Materials Science and Technology, Academic Press, Inc. New York pp. 229-292 1989

(d) Articles in books

- [11] E. Ruh, L. Geczi, R. L. Lehman, "Ceramic and Glass Foodware Safety", 100 Innovations of the Past 100 Years", American Ceramic Society, Westerville, OH, pp 103-105. 1999
- [12] R. L. Lehman, "Ceramics Business Review", Encyclopaedia Britannica, 1998 Book of the Year, Chicago, p165 1998

- [13] R. L. Lehman, "Ceramics Business Review", Encyclopaedia Britannica, 1997 Book of the Year, Chicago, p166 1997

(e) **Instructional Text Notebooks**

- [14] **Glass Melting and Forming Technology**, Authored/Edited by Richard L. Lehman, Published by The Center for Professional Advancement, New Brunswick, First Edition, 1998, revised and reissued periodically, latest edition 1998, Approximately 280 pages. 1998
- [15] **Ceramic Manufacturing Technology**, Authored/Edited by Richard L. Lehman and D. J. Shanefield, Published by The Center for Professional Advancement, New Brunswick, First Edition, 1998, revised and reissued periodically, latest edition 1998, Approximately 375 pages. 1998
- [16] **Sol-Gel Technology**, Authored/Edited by John Ballato, D. J. Shanefield and Richard L. Lehman, Published by The Center for Professional Advancement, New Brunswick, First Edition, 1998, revised and reissued periodically, latest edition 1998, Approximately 280 pages. 1998
- [17] **Essentials of Ceramic Technology**, by Richard L. Lehman, V. A. Greenhut, and D. J. Shanefield, Published by The Center for Professional Advancement, New Brunswick, First Edition, Approximately 775 pages. 1994
- [18] **Ceramic Engineering -- The Basics**, by Richard L. Lehman, V. A. Greenhut, and D. J. Shanefield, Published by The Center for Professional Advancement, New Brunswick, First Edition, Approximately 390 pages. 1992
- [19] **Ceramic Engineering -- Beyond The Basics**, by Richard L. Lehman, V. A. Greenhut, and D. J. Shanefield, Published by The Center for Professional Advancement, New Brunswick, First Edition, Approximately 440 pages. 1992
- [20] **Structural Ceramics**, by Richard L. Lehman and V. A. Greenhut, Published by The Center for Professional Advancement, New Brunswick, Approximately 500 pages. 1990
- [21] **Fundamentals of Glass Technology**, Authored/Edited by Richard L. Lehman, Published by The Center for Professional Advancement, New Brunswick, First Edition, 1984, revised and reissued periodically, latest edition 1995, Approximately 700 pages. 1984

Selected Journal Articles

	Description	Year
[1]	Jayant Joshi and Richard Lehman, "Assessment of the Development of Phase Co-continuity in Immiscible Polymer Blends by Image Analysis of Planar Surfaces," submitted to Polymer Engineering	Submitted
[2]	Kim-Phuong Le, Richard L. Lehman,*, Adrian B. Mann, James D. Idol, "Raman Characterization in Blends of Poly(L-lactide) and Poly(methyl methacrylate)," submitted to Applied Spectroscopy, December 2006.	Submitted
[3]	Kim-Phuong Le, Richard Lehman, Kenneth VanNess, Michelle Dickinson, "Mechanical Characterization of Poly(L-lactide) and Poly(methyl methacrylate) Blends," submitted to Materials Science and Engineering A, December 2006	Submitted
[4]	Wantinee Viratyaporn, Richard L. Lehman, and Jayant Joshi, "Effect of Composition and Processing on the Impact Behavior of Certain Immiscible Polymer Blends", accepted, Polymer Engineering Science.	Submitted
[5]	Vivek Thirtha, Richard Lehman, Thomas Nosker Effect of additives on the compositional glass transition variation in PS/PP blends, Journal of Applied Polymer Science, Volume 107, Issue 6 p 3987-3992	2007
[6]	Zeena Cherian, Richard Lehman, "Investigation into the morphology and mechanical properties of melt-drawn filaments from uncompatibilized blends of polystyrene and high-density polyethylene", <i>Journal of Applied Polymer Science</i> , Volume 103, Issue 3, Date: 5 February 2007, Pages: 1616-1625.	2007
[7]	Vivek Thirtha, Richard Lehman, Thomas Nosker, "Morphological effects on glass transition behavior in selected immiscible blends of amorphous and semicrystalline polymers", <i>Polymer [47]</i> pp. 5392 - 5401	2006
[8]	Jayant Joshi, Richard Lehman, Gene Hall, "Insight into the molecular arrangement of HDPE polymer chains in blends of PS/HDPE from DSC and Raman techniques", Applied Spectroscopy, Volume 60, Number 5, pages 483-489.	2006
[9]	Kim-Phuong N. Le, Richard Lehman, James D. Idol, "Multiphase Blends from Poly(L-lactide) and Poly(methyl methacrylate)", <i>Journal of Biomaterials Science. Polymer Edition</i> , Volume 17, No. 1--2, pp. 1—246 (2006).	2006
[10]	Jayant Joshi, Richard Lehman, Thomas Nosker, "Selected Physical Characteristics of Polystyrene/High Density Polyethylene Composites Prepared from Virgin and Recycled Materials", <i>Journal of Applied Polymer Science</i> , Volume 99, Issue 5, 5 March 2006, Pages: 2044-2051 (2006).	2006

- [11] Vivek Thirtha, Richard Lehman, Thomas Nosker, "Glass Transition Phenomena In Melt-Processed Polystyrene/Polypropylene Blends", Journal of Polymer Engineering & Science, Volume 45, Issue 9 , Pages 1187 - 1193 2005
- [12] Zeena Cherian and Richard Lehman, "Effects of adhesive type and polystyrene concentration on the shear strength of bonded polystyrene/high density polyethylene blends", International Journal of Adhesion and Adhesives, Volume 25, Issue 6 , Pages 502-506 (2005). 2005

Issued Patents

No.	Author/Title	Date
[1]	R. L. Lehman, "System for and method of batch analysis and optimization for glass manufacturing", US Patent 7,565,816. July 28, 2009.	2009
[2]	R. L. Lehman, "System for and method of batch analysis and optimization for glass manufacturing", US Patent 7,386,997. June 17, 2008.	2008
[3]	R. L. Lehman, "Method of analyzing mixed-color cullet to facilitate its use in glass manufacture", US Patent 7,383,695, June 10, 2008.	2008
[4]	R. L. Lehman, "Automated Process for recycling batches of mixed color cullet into amber, green, or flint glass with selected properties", US Patent 6,763,280, October 26, 2004.	2004
[5]	R. L. Lehman, "Method of recycling batches of mixed color cullet into amber, green, or flint glass with selected properties", US Patent 6,810,301, July 13, 2004.	2004
[6]	R. L. Lehman et al., "Co-Continuous Phase Composite Polymer Blends For In-Vivo And In-Vitro Biomedical Applications", US Patent Application , June 6, (2003).	2003
[7]	Thomas J. Nosker , Richard W. Renfree, Richard Lehman, and Thomas Tsakalacos Thermally sprayable coatings to impart radar absorbent properties, US Patent Application , September 17, 2003	2003
[8]	R. L. Lehman et al., "Functional PLA and PMMA IMPBs for In-Vivo and In-Vitro Biomedical Applications", Provisional Patent Application , June 6, 2002.	2002
[9]	R. L. Lehman, "Coating and filler materials for use in localized thermal processing of glazed ceramics 2002-12-24", US Patent 6,498,116, December 24, 2002.	2002
[10]	R. L. Lehman, "Method of recycling batches of mixed color cullet into amber, green, or flint glass with selected properties", US Patent 6,230,521, May 15, 2001.	2001
[11]	R. L. Lehman, "Cathode Ray Tubes Having Reduced Glass Browning Properties", US Patent 6,097,144, August 1, 2000.	2000
[12]	R. L. Lehman, Y. Umez, J. Li, D. E. Murnick, J. Colaizzi, "Method of Thermally Glazing and Article", US Patent 6,127,005, October 3, 2000.	2000
[13]	R. L. Lehman, "Electrochemical Heat Source", US Patent 5,538,020, July 23, 1996.	1996

- [14] E. G. Farrier, R. L. Lehman, J. J. Chiou, "Method of Forming an Electrochemical Heat Source", US Patent 5,357,984, October 25, 1994. 1994
- [15] C. K. Banerjee, J. J. Chiou, E. G. Farrier, T. L. Gentry, R. L. Lehman, H. T. Ridings, A. J. Sensabaugh, M. D. Shannon, "Tobacco Smoking Article With Electrochemical Heat Source, Giving Fee, Taste And Satisfaction Like Combustion Both With No Side Stream Smoke Or Carbon Monoxide", US Patent 5,285,798, February 15, 1994. 1994
- [16] C. K. Banerjee, R. L. Lehman, R. F. Hayden, D. L. Raynor, "Smoking Article With Improved Insulation ", US Patent 5,303,720, April 19, 1994. 1994
- [17] E. G. Farrier, O. P. Furin, R. L. Lehman, J. T. Meers, J. L. Resce, D. M. Riggs, M. D. Shannon, "Fuel Element For Smoking Article -- Comprises Pressure Formed Carbonaceous Material, And Ceramic Oxide, Boride, Nitride Or Carbide Catalyst.", US Patent 5,211,684 May 18, 1993. 1993
- [18] R. F. Hayden, E. C. Jones, J. W. Lawson, R. L. Lehman, P. F. Perfetti, "Paper Containing Fibrous Filler Including Calcium Sulfate", US Patent 5,103,844, April 14, 1992. 1992
- [19] J. S. Gentry, G. R. Shelar, R. L. Lehman, J. L. Resce, O. D. Furin, S. W. Jakob, W. C. Squires, M. D. Shannon, "Cigarette Including Agglomerated Matrix Filler Giving Low Incomplete Combustion Products, Low Side-Stream Tar And Odor, And Sustaining Smolder", US Patent #5,105,836, April 21, 1992. 1992
- [20] J. S. Gentry, G. R. Shelar, M. D. Shannon, R. L. Lehman, J. L. Resce, R. Hayden, D. O. Furin, A. B. Norman, "Cigarette with agglomerated matrix filter giving low incomplete combustion products and visible side-stream smoke levels, European Patent #419733, April 3, 1991. 1991
- [21] S. W. Jacob, E. G. Farrier, J. L. Resce, J. S. Gentry, G. R. Shelar, M. D. Shannon, R. L. Lehman, and R. L. Hayden, "Cigarette with agglomerated matrix filler giving low Incomplete Combustion Products, Low Side-Stream Tar And Odor, And Sustaining Smolder", European Patent #419975, April 3, 1991. 1991
- [22] K. J. Wise and R. L. Lehman, "Low-Density Agglomerate Containing Calcium Carbonate With Carbohydrate Binder, Useful As A Filler Or Bulking Agent", European Patent #439373, July 31, 1991. 1991
- [23] J. S. Gentry, G. R. Shelar, M. D. Shannon, R. L. Lehman, J. L. Resce, R. F. Hayden, O. P. Furin, A. B. Norman, T. A. Perfetti, ", US Patent 5,074,321, December 24, 1991 1991
- [24] J. Damiano, R. L. Lehman, and C. R. Griffin, "Low-density calcium carbonate agglomerate prepared by forming aqueous slurry containing precipitated calcium carbonate and optional dissolved alkali metal polyphosphate, heating and mechanical processing", European Patent 386868 (Basic), Assigned to Pfizer Corporation, New York, NY, September 12, 1990. 1990
- [25] M. D. Shannon, R. L. Lehman, J. L. Resce, O. D. Furin, J. T. Jeers, D. M. Riggs, E. G. Farrier, "Ceramic Catalyst Addition To Tobacco Fuel Element, Giving Reduced Carbon Monoxide Content Of Mainstream Smoke Without Affecting Taste, Feel Or Satisfaction", World Patent 900920 (Basic), September 20, 1990. [Total World Patent Family = 4] 1990

- [26] C. K. Banerjee, R. L. Lehman, W. C. Squires, R. F. Hayden, D. L. Raynor, "Smoking Article With Improved Insulating Material Giving Tobacco Flavor From Heated But Not Burnt Tobacco For Use As Cigarette Substitute" European Patent 399252, November 28, 1990. Number of Patents: 3 1990
- [27] C. K. Banerjee, D. C. Kay, R. L. Lehman, "Substrate With Median Pore Diameter Increased By Heating", US Patent #4,827,950, May 9, 1989. Number of Patents in Group: 14. 1989
- [28] R. L. Lehman, "Phosphoric Acid as a Chemical Constituent and a Batch Wetting Agent for Glass Manufacture", US Patent #4,526,603 Assigned to FMC Corporation, Philadelphia, PA, July 1985. 1985
- [29] R. L. Lehman and J. A. Shepard, "Formulation of Phosphate Rock Slurries", US Patent #4374817, Assigned to FMC Corporation, Philadelphia, PA, February 22, 1983. Number of Patents in Group: 2 1983