

FERNANDO CADENA, Ph.D., P.E.
(Civil/Environmental Engineer)

Education

B.S. in Civil Engineering, 1970, Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico
M.S. in Civil Engineering, 1973, New Mexico State University, Las Cruces, New Mexico
Ph.D. in Environmental Engineering, 1977, California Institute of Technology, Pasadena, California

Professional Affiliations

Registered Civil Engineer in New Mexico (7896)
SEP Licensed Civil Engineer in Mexico (183972)
American Society of Civil Engineers
American Society of Engineering Education
American Water Works Association
Water Pollution Control Federation

Honorary Affiliations

Phi Kappa Phi
Chi Epsilon

Inventions

Computerized constant-pressure respirometer
Computerized constant-pressure gas meter for anaerobic reactors.
Zeoloc (a hazardous waste microencapsulation material)
Paralite (patented product for removal of organics from water)

Languages

English, Spanish, Portuguese

Awards

Frank Bromilow Excellence in Research Award (1991)

Experience Record

1977-1979	Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM), Mexico. Assistant Professor, Civil Engineering Department. Responsible for teaching undergraduate and graduate level courses in civil and environmental engineering. Industrial Pollution Consultant for the Dirección Asociada de Ingeniería. Consulting studies include industrial wastewater plant designs, evaluation of contaminants in water supplies and industrial wastewaters.
1980	Engineering-Science, Inc. Arcadia, CA, Civil and Environmental Engineer. Responsible for study, research and design of water and wastewater treatment facilities. Projects include preparation of industrial wastewater pollution control studies and writing of an industrial pollution ordinance for Aleppo and Lattakia, Syria; design of influent pumping station for the Flint River WPCP; design of tertiary treatment system for Pepperdine University; and preparation of feasibility study for the use of digester gas for power generation for the City of Atlanta, Georgia.
1980-Date	New Mexico State University. Professor, Department of Civil Engineering. Researcher. Responsible for teaching undergraduate and graduate courses in

Civil and Environmental Engineering. Graduate level courses include Physico-chemical Processes, Environmental Chemistry, Detection of Environmental Contaminants, and Industrial Pollution Control. Chemistry courses based on use of computer-generated pH-pC diagrams for understanding chemical equilibrium. Visiting Researcher, and Special Term Appointee, Argonne National Laboratory. Research studies at NMSU include:

1. Department of Energy, Waste Management Education and Research Consortium. a) Physico-chemical treatment of oilfield wastes. b) Removal of hazardous contaminants from drinking waters contaminated with petrochemicals and heavy metals.
2. New Mexico Water Resources Research Institute. a) Volatilization of hazardous pollutants from rapid streams. b) Sulfide oxidation in drinking waters using hydrogen peroxide. c) Use of tailored clays for the removal of hazardous VOC. d) Removal of arsenic from water using ferrous iron oxidation.
3. City of Albuquerque. Liquid Wastes Division. Odor and corrosion control program optimization New Mexico Environmental Improvement Division. Sulfides Control in Drinking Water using hydrogen peroxide.
4. Argonne National Laboratory, Argonne, Illinois. a) Computer modeling hazardous waste transport in groundwater. b) Environmental aspects of the Great Plains Coal Gasification Plant. c) Environmental evaluation of transportation and processing of oil and natural gas. d) Evaluation of treatment alternatives for the Otis Waste Water Treatment Plant. e) VOC inventory at DOD facilities. f) Removal of hazardous materials in groundwaters.
5. National Science Foundation, Washington, D.C. Adsorption of Hazardous Pollutants on Tailored Smectites.
6. Petroleum Environmental Research Forum (Texaco, UNOCAL, Shell Oil, AMOCO and Elf Acutane). Use of organozeolites for BTEX removal.
7. Sandia National Lab (PSL). Environmental assessment studies at collision and explosive sites.
8. International Atomic Energy Agency, Vienna, Austria. Mission expert on radioactive waste disposal in developing countries. Evaluated radioactive waste disposal practices in ten developing countries in four continents.

Publications

F. Cadena. "Hydraulics of Solid Waste Mixtures Through Horizontal Pipes," M.S. Thesis, New Mexico State University, 1972.

W. S. Midkiff, G. A. O'Connor, and **F. Cadena.** "The Calcium Carbonate Ion-Pair as a Limit to Hardness Removal," Journal of American Water Works Association, 1974.

G. A. O'Connor, and **F. Cadena.** "Calcite Equilibrium in Mixed Ion Aqueous Systems Open to the Atmosphere," Soil Science, 1975.

F. Cadena. "Temperature Effects on the Activity Coefficient of the Bicarbonate Ion," Ph.D. Dissertation, California Institute of Technology, 1977

F. Cadena, and G. A. Eiceman. "Environmental Modeling of Toxic Pollutants in Rivers, New Mexico Professional Engineer, 1983.

F. Cadena, and G. A. Eiceman. "Removal of Volatile Organic Pollutants from Rapid Streams," Journal of Water Pollution Control Federation. 56:5:460, 1984.

F. R. Sprester, and **F. Cadena.** "Characterization and Treatment of Spent Hydrostatic Test Water in the Natural Gas Industry," Proc. of the 41st Annual Purdue Industrial Waste Conference, 1986 pp. 488-496.

D. J. Fingleton, **F. Cadena,** et al. "Assessing Exposure to Toxic Substances from Land Disposal of Hazardous Wastes," Proc. of the 79th Annual Meeting of the Air Pollution Control Association, 1986.

F. Cadena and S. W. Jeffers. "Use of Tailored Clays for Selective Adsorption of Hazardous Pollutants," Proc. of the 42nd Annual Purdue Ind. Waste Conf., pp. 113-119, 1987.

F. Cadena, and R. W. Peters. "Evaluation of Chemical Oxidizers for Hydrogen Sulfide Control," Journal of Water Pollution Control Federation, 60:7:1259, July 1988.

F. Cadena, A. Drohobyczer, M. I. Beach, and D. Barnes. "A Novel Approach to Simplified Respirometric Oxygen Demand Determinations," Proc. of the 43rd Annual Purdue Ind. Waste Conf., pp. 459-467, 1988.

F. Cadena. "Numerical Approach to Solution of Pollutant Transport Models Using Personal Computers," Computers in Education Division of ASEE (CoED), 9:2:34-38, April - June 1989.

F. Cadena. "Use of Tailored Bentonite for Selective Removal of Organic Pollutants," Journal of Environmental Engineering Division, American Society of Civil Engineers, 115:4:756-767, August 1989.

R. B. Jacquez, **F. Cadena**, S. Prabhakar, and M. I. Beach. "Gas Transfer Limitations in Respirometric Applications," Proc. of the 44th Annual Purdue Ind. Waste Conf., pp. 425-433, 1989.

F. Cadena, D. J. Fingleton, and R. W. Peters. "Evaluation of VOC Emissions from Landfarming Operations." Proc. of the 44th Annual Purdue Ind. Waste Conf., pp. 453-463, 1989.

R. W. Peters, C. A. Wentz and **F. Cadena**. "The University Role in Hazardous Waste Management: Faculty Publications, Teaching and Research." Proc. of the 22nd Mid Atlantic Ind. Waste Conf. pp. 718-740, 1990.

F. Cadena, R. Rizvi and R. W. Peters. "Feasibility Studies for the Removal of Heavy Metals from Solution Using Tailored Bentonite." Proc. of the 22nd Mid Atlantic Ind. Waste Conf. pp 77-94, 1990.

A. T. Hanson and **F. Cadena**. "Use of Personal Computers as an Integrating Strip Chart Recorder in the Environmental Engineering Laboratory." Computers in Education Division of ASEE (CoED), 10:4:79-82, October - December, 1990.

F. Cadena, R. Garcia and R. W. Peters. "Adsorption of Benzene from Aqueous Solutions by Bentonite Treated with Quaternary Amines." Environmental Progress, 4:4:245-253, November, 1990.

D. R. Lindsay, **F. Cadena**, and G. A. Eiceman. "Microorganism Detection Using Ion Mobility Spectrometry." Proc. of the AWWA Water Quality Technology Conference, Part I, pp. 557-568, 1990.

M. I. Beach, R. B. Jacquez, **F. Cadena**, and A. Shah. "A Computerized Respirometric Method for Determining Inhibition Potential" Proc. of the 45th Annual Purdue Ind. Waste Conf., pp. 487-489, 1991.

F. Gao, **F. Cadena**, and R. W. Peters. "Use of Tailored Zeolites for Removal of Benzene, Toluene and Xylenes from Water." Proc. of the 45th Annual Purdue Ind. Waste Conf., pp. 509-516, 1991.

J.S. Janks and **F. Cadena**. "Identification and Properties of Modified Zeolites for the Removal of Benzene, Toluene, and Xylene from Aqueous Solutions." Proc. of the 66th Annual Technical Conf. and Exhibitions of the Soc. of Petroleum Engineers, SPE 22833, pp. 153-167, 1991.

F. Cadena, G. Rico and J. Beasley. "Use of a PC Game Control Adapter as a Data Acquisition System. Application to Temperature Measurement." Computers in Education Division of ASEE (CoED), 1:4:41-45, 1991.

R. Peters, E. Cazares and F. Cadena. "Regeneration of Exhausted Tailored Clays by Adsorbate Volatilization." Proc. of the 46th Annual Purdue Ind. Waste Conf., pp 501-506, 1991.

F. Cadena, I. Santiago and M.I. Beach. "Modification of Aerobic Respirometer to Assess Biodegradability and Toxicity of Compounds in Anaerobic Processes." Proc. of the 46th Annual Purdue Ind. Waste Conf., pp 651-657, 1991.

F. Cadena, R. W. Peters and F. S. Vigil. "Tailoring of Zeolites for Adsorption of Benzene, and Toluene from Solution," Proc. of the 47th Annual Purdue Ind. Waste Conf., pp 225-235, 1992.

I. Santiago, V. P. Worland, E. Cazares and **F. Cadena**. "Adsorption of Hexavalent Chromium onto Tailored Zeolite." Metal Finishing Magazine Vol. 90, No. 11, 37-43, Nov. 1992.

Janks, J. S., and **F. Cadena**. "Investigations into the Use of Modified Zeolites for Removing Benzene, Toluene and Xylenes from Saline Produced Water." In J. P. Ray and F. Ranier Engelhardt (eds.), Produced Water - Technological/Environmental Issues and Solutions: Environmental Research, Vol. 46, Plenum Press, NY, pp 473-487, 1992.

I. Santiago, V. P. Worland, E. Cazares and **F. Cadena**. "Adsorption of Hexavalent Chromium onto Tailored Zeolite." Proc. of the 47th Annual Purdue Ind. Waste Conf., pp 699-710, 1992.

J. Covey, W. S. Midkiff and **F. Cadena**. "Treatment of Wastewater from Plutonium Enrichment Operations." Proc. of the 47th Annual Purdue Ind. Waste Conf., pp 33-40, 1992.

F. Cadena, and R. S. Bowman. "Treatment of Waters Contaminated with BTX and Heavy Metals Using Tailored Zeolites," Radioactive Waste Management and Environmental Restoration, Vol. 18 , pp 27-40, 1994.

N. Nirmalakhandan, F. Arulgnanendran, M. Moshin B. Sun and **F. Cadena**. "Toxicity of Mixtures of Organic Chemicals to Microorganism," Water Resources, **28**, 3, 543-551, 1994.

F. Cadena, and R. S. Bowman. "Treatment of Waters Contaminated with BTX and Heavy Metals Using Tailored Zeolites, Proc. of the 4th Annual WERC Technology Development Conference., 297-310, April 13-15, 1994.

F. Cadena and E. Cazares. "Sorption of Benzene, Toluene, and o-Xylene from Aqueous Solution on Surfaces of Zeolitic Tuffs Modified with Organic Cations" Natural Zeolites '93. D. W. Ming and F. A. Mumpton, eds., Int. Comm. Natural Zeolites, 309-324, 1995.

F. Cadena and T. L. Kirk. "Arsenate Precipitation Using Ferric Iron in Acidic Conditions," 5th Annual WERC Technology Development Conference, 3-13, April 18-20, 1995.

F. Cadena and T. L. Kirk. "Arsenate Precipitation Using Ferric Iron in Acidic Conditions," Proc. of the fall, 1995 Meeting. Texas Section of the American Society of Civil Engineers, 69-80, October 5-7, 1995, El Paso, TX.

F. Cadena and T. L. Kirk. "Arsenate Precipitation Using Ferric Iron in Acidic Conditions," Proc. of the Second International Petroleum Environmental Conference, pp. 149-164, September 25-27, 1995, New Orleans, LA.

F. Cadena "Removal of BTEX from Produced Waters Using Tailored Zeolites," Proc. of the Second International Petroleum Environmental Conference, pp. 165-178, September 25-27, 1995, New Orleans, LA.

F. Cadena and E. Cazares. "Use of Organozeolites for the Removal of Organic Contaminants from Water," Clay Minerals Society Workshop Lectures, Vol. 8, Organic Pollutants in the Environment, Sahweny, B. ed, The Clay Mineral Society, Boulder, CO, pp 69-94, 1996.

F. Cadena and M. Roman. "Wastewater Treatment Using Electrochemical Systems," Proc. of the Third International Petroleum Environmental Conference, September 24-27, 1996, Albuquerque, NM, pp 189-202.

F. Cadena and M. Zigmond. "Air Emission Control Using Zeolitic Materials," Proc. of the Third International Petroleum Environmental Conference, September 24-27, 1996, Albuquerque, NM, pp 785-798.

G. Smith, G. A. Eiceman, M. K. Walsh, S. A. Critz, E. Andazola, E. Ortega and **F. Cadena**. "Detection of Salmonella Typhimurium by Hand-held Ion Mobility Spectrometer: A Qualitative Assessment of Response Characteristics." Field Analytical Chemistry and Technology, 1(4):213-226, 1997.

F. Cadena, T. Helmuth, A. Hyde and E. Steelman. "General Education for Non-Engineering Students," Proc. of the 1997 ASEE Gulf-Southwest Annual Conf. March 23-25, 1997, Houston, TX, pp 180-185.

F. Cadena and M. J. Zigmond. "Air Emission Control Using Zeolitic Materials," Proc. of the WERC/HSRC '97 Joint Conference on the Environment, April 22-24, 1997, Albuquerque, NM, pp 13-20.

F. Cadena and C. J. Pulskamp. "Use of Paraffin Coated Zeolites (Paralite™) for the Removal of Benzene from Water," Proc. of the Fourth International Petroleum Environmental Conference, September 9-12, 1997, San Antonio, TX, pp 1060-1068.

F. Cadena, M. J. Zigmund and C. P. Payne "Air Emission Control Using Zeolitic Materials Impregnated with Potassium Permanganate," Proc. of the WERC/HSRC '98 Joint Conference on the Environment, March 31 - April 1, 1998, Albuquerque, NM, pp 9-14.

J. Bates, A. Hanson, **F. Cadena**, B. Thomson, M. Johnson, D. Heil and A. Bristol, "Technologies for the Removal of Arsenic from Water in New Mexico," New Mexico Journal of Science, pp. 332-347, 1998.

F. Cadena and M. J. Zigmund. "Selection of Natural Minerals for Air Emission Control Applications," Proc. of the Fifth International Petroleum Environmental Conference, October 20-23, 1998, Albuquerque, NM, pp. 1353-1362.

F. Cadena and H. Torres. "Organic Biocide Control Using Natural Zeolites," Proc. of the Sixth International Petroleum Environmental Conference, November 16-18, 1999, Houston, TX, pp. 30-37.

F. Cadena and J. T. Zellmer. "Suggestions to Simplify ABET 2000 Preparations," ASEE Gulf-Southwest 2000 Conference, Las Cruces, NM, <http://spacegrant.nmsu.edu/conference/2000/papers/Cadena.htm>, 2000.

G. W. Thompson, M. R. Jollett, **F. Cadena** and C. Weisman. "Removal of MTBE Using Organozeolites," Proc. of the Seventh International Petroleum Environmental Conference, November 7-10, 2000, Albuquerque, NM, pp. 813-844.

F. Cadena and J. T. Zellmer. "Suggestions to Simplify ABET 2000 Preparations," ASEE Gulf-Southwest 2000 Conference, Las Cruces, NM, in press.

A. L. Ulery and **F. Cadena**, G. Thompson. "Dairy Wastewater Biodegradation and Hydrologic Balance," Proc. of the Environmental Health Conference '00 Joint Conference on the Environment, October 22 -25, 2000, Albuquerque, NM.

F. Cadena. "Implementing Innovative Visual Aids in Engineering Education" 2002 Science, Engineering and Technology Education Conference, January 4, 2002 Las Cruces, NM, <http://spacegrant.nmsu.edu/conference/2002/index.htm>.

M. R. Jollett, **F. Cadena** and G. W. Thompson. "Selection of Granular Activated Carbon for Water Contaminated with MTBE," Proc. of the Eighth International Petroleum Environmental Conference, November 6 - 9, 2001, Houston, TX, in press.

F. Cadena, S. I. Abed. Use of Computer Spreadsheets as an Aid in the Development of Acid-Base Equilibrium Diagrams." Computers in Education Division of ASEE (CoED). Accepted for publication.

F. Cadena and H. Magallanez. "Analytical Solution for Circular Gates as Flow Metering Structures." Journal of the Hydraulics Division of the American Society of Civil Engineers. In preparation.

Technical Reports (1986 to present)

"Microcomputer Implementation of a Two Dimensional Groundwater Solute Transport Model (ANL-TDST)," Argonne National Laboratory, Argonne, Illinois, 1986.

"Environmental Aspects of the Natural Gas Industry," Argonne National Laboratory, Argonne, Illinois, 1986

"Environmental Assessment of Hydrostatic Testing in the Natural Gas Industry," Argonne National Laboratory, Argonne, Illinois, 1986

"Waste Characterization of Onshore Operations in the Oil and Gas Industry," Argonne National Laboratory, Argonne, Illinois, 1986

"Review and Technical Analysis of EPA's Hazardous Waste Management System; Land Disposal Restrictions; Proposed Rule (40 CFR Part 260 et al.)," 1986.

- "Chemical Odor Control Program for the City of Albuquerque," Albuquerque, New Mexico, 1987.
- "A Proposed Plan for the Management of Underground Storage Tanks at Travis Air Force Base, California," Argonne National Lab, 1987.
- "Volatile Organic Compounds (VOC) Emissions Inventory for Dobbins AFB," Argonne National Lab, 1988.
- "Volatile Organic Compounds (VOC) Emissions Inventory for Costa Mesa, North Highlands, Ontario and Sepulveda Air National Guard Stations," Argonne National Lab, 1988.
- "Treatment of Water Supplies Contaminated with Toxic Pollutants Using Tailored Soils," New Mexico Water Resources Research Institute, 1988.
- "Economic Impact of Environmental Regulations on the Oil and Gas Industry," Department of Energy, Argonne National Lab, Argonne, Illinois, 1988.
- "Optimization Program at the Otis Air National Guard Base Wastewater Treatment Facility," Argonne National Lab, 1988.
- "Treatment of Water Supplies Contaminated with Toxic Pollutants Using Tailored Soils," New Mexico Water Resources Research Institute Report No. 235, 1988.
- "Regenerative Properties of Tailored Soils" New Mexico Water Resources Research Institute Report No. 254, 1990.
- "Flyer Plate Site Lead Contamination Study," Presented to Sandia National Lab through PSL, 1992.
- "Arsenate Precipitation Using Ferric Iron in Acidic Conditions," New Mexico Water Resources Technical Completion Report No. 293, 17 pp, 1995.
- "BTEX Removal From Contaminated Groundwater Using Tailored Zeolites A Field Demonstration Project)," Petroleum Environmental Research Forum, Final Report, 1995.
- "BTEX Removal from Contaminated Groundwater Using Tailored Zeolites: A Filed Demonstration Project," New Mexico Waste-management Education Research Consortium, Technical Report 01-4-23196, 1996.
- "Simultaneous Removal of Anionic, Cationic, and Neutral Hazardous Pollutants from Aqueous Solutions," New Mexico Waste-management Education Research Consortium, Technical Report 01-4-23190, 1996.
- "Treatment of VOC Air Emissions Using Zeolitic Materials," New Mexico Waste-management Education Research Consortium, Technical Report 0103, 1998.
- "Laboratory Evaluation of Alpha Biocat for Dairy Wastewater Treatment," New Mexico Waste-management Education Research Consortium, Technical Report, 1998.
- "Air Emissions Control Using Zeolitic Materials Impregnated with Potassium Permanganate," New Mexico Waste-management Education Research Consortium, Technical Report, 1998.
- "Treatment of VOC Air Emissions Using Zeolitic Materials – Phase 2" New Mexico Waste-management Education Research Consortium, Technical Report, 1999.
- "Improved Dairy Wastewater Biodegradation and Odor Control," New Mexico Waste-management Education Research Consortium, Technical Report, 2000.
- "Treatment of Arsenic-Contaminated Water Using UV-Akaganeite Adsorption," New Mexico Waste-management Education Research Consortium, Technical Report, 2001 (Pending).

SUMMARY OF FUNDED RESEARCH (1986-DATE)

Proposal Name	Role	Agency	Budget Dollars	Durat. Years
Int'l Conf. on Env. Engrg. & Natural Resources	P/I	CIP	1,000	1
Odor Control in the Albuquerque Sewer System (II)	P/I	City of Alb.	22,000	1
Adsorptive Properties of Tailored Smectite	P/I	NSF/RIMI	206,000	3
Idem (NMSU Cost Share)	P/I	NMSU	14,000	3
Treatment of Water Supplies with Tailored Soils	P/I	NMWRRI	25,000	1
Sabbatical Leave Support	P/I	ANL	54,000	1
Respirometer Donation, Unit 1	P/I	N-CON	12,000	N/A
Research Experiences for Undergraduates	P/I	NSF/EU	8,000	1
Adsorptive Properties of Tailored Smectite	P/I	NSF/RIMI	292,000	3
Idem (NMSU Cost Share)	P/I	NMSU	24,000	3
Cleanup of Gasoline Spill at Los Angeles AFB	P/I	ANL	55,000	1
Regeneration of Spent Soils for Treatment of Water Supplies	P/I	NMWRRI	25,000	1
Treatment of Waters Contaminated with BTX	P/I	WERC	65,000	2
Treatment of Oilfield Produced Water	Co-P/I	WERC	71,000	1
Treatment of oily wastes using tailored zeolites	P/I	Texaco	33,000	1
Modeling joint effects of mixtures of chemicals	Co-P/I	USAF	323,000	3
Environmental Assessment at Sandia National Lab	P/I	PSL/SNL	30,000	1
Online Detect. of Microorgs. Using Ion Mobility Spectrometry	P/I	NSF/RIMI	300,000	3
Respirometer Donation	P/I	N-CON	12,000	N/A
GEM/USEPA Minority Program at NMSU	P/I	USEPA	100,000	2
GEM/USEPA Minority Program at NMSU	P/I	USEPA	75,000	2
GEM/USEPA Minority Program at NMSU	P/I	USEPA	93,000	2
Removal of Arsenic from Drinking Water	P/I	NMWRRI	10,000	1
Petroleum Environmental Research Forum (PERF)	P/I	PERF	55,000	2
Gas Phase Hydrocarbon Adsorption using Zeolites	Co P/I	WERC	34,000	1
Electrochemical Denitrification	P/I	WERC	14,000	1
Control of VOC with Permanganate Zeolites	P/I	WERC	60,000	1
Web Course Development	P/I	PSL/NBIF	27,000	1
WWW Site Development	P/I	PSL/NBIF	19,000	1
Minority Fellowship	P/I	USEPA	8,000	1
Evaluation of Biocatalyst for Dairy Wastewater Treatment	P/I	WERC	16,000	1
Minority Fellowship	P/I	USEPA	21,000	1
Improved dairy wastewater biodegradation and odor control	Co-P/I	WERC	63,000	1
Treatment of Arsenic-Contaminated Water w Akaganeite I	P/I	WERC	60,000	1
Treatment of Arsenic-Contaminated Water w Akaganeite II	P/I	WERC	63,000	1
Total Funded Research			2,290,000	15