Thomas H. Fletcher

Professor, Chemical Engineering Department
Brigham Young University

Education

- B. S. Chemical Engineering, Brigham Young University, 1979
- M. S. Chemical Engineering, Brigham Young University, 1980
- Ph. D. Chemical Engineering, Brigham Young University, 1983

Experience

- Combustion Research Facility, Sandia National Laboratories, Livermore, California
  - Senior Member of Technical Staff, 1984-1991
- Chemical Engineering Department, Brigham Young University
  - Associate Professor, 1991-1997
  - Professor, 1997-present
  - Taught classes at BYU in Coal Combustion, Combustion Fundamentals, Combustion Modeling, Energy and Fossil Fuels, Chemical reactor Design, and Process Control.
- Advanced Combustion Engineering Research Center (ACERC) at BYU and the U. of Utah
  - Associate Director, 1993-1997
  - Director as of Sept. 1, 1997

Research Interests

- Fundamental coal devolatilization and combustion science
- Nitrogen evolution from organic materials
- Coal-derived soot
- Turbulence and combustion
- Laser and optical diagnostics in combustion systems
- Comprehensive combustion modeling
  - pulverized coal combustion
  - coal gasification
  - gas turbine combustion

Publications and Presentations

- Co-author on 1 book and 1 book chapter
- 42 peer-reviewed publications
- Advisor on 6 M.S. Theses and 2 Ph.D. Dissertations
- 83 presentations at national or international technical meetings

Major Coal-Related Models Developed

- Chemical Percolation Devolatilization (CPD) model for coal pyrolysis (1992)
- Pulverized Coal Gasification and Combustion in 2-dimensions (PCGC-2) (1983)

Professional Organizations

- The Combustion Institute
- ACS Division of Fuel Chemistry

Relevant Publications of Dr. Thomas H. Fletcher

Thomas H. Fletcher

Books and Book Chapters

1. Smith, L. K., L. D. Smoot, T. H. Fletcher, and R. J. Pugmire, "Chapter 3. Coal Characteristics, Structure, and Reaction Rates," in *Fundamentals of Coal Combustion for Clean and Efficient Use*, edited by L. D. Smoot, Elsevier, New York (1993).
2. Smith, L. K., L. D. Smoot, T. H. Fletcher, and R. J. Pugmire, *The Structure and Reaction Processes of Coal*, Plenum Press, New York (1994).

Peer-Reviewed Journal Articles
(in reverse chronological order)

47. Solum, M. S., A. Sarofim, R. J. Pugmire, T. H. Fletcher, and H. Zhang, "C-13 NMR Analysis of Soot Produced from Model Compounds and a Coal," in preparation (2001).
46. Rigby, J., J. Ma, B. W. Webb, and T. H. Fletcher," Transformations of Coal-Derived Soot at Elevated Temperature," accepted, *Energy & Fuels* (2000).
45. Perry, S., E. M. Hambly, T. H. Fletcher, M. S. Solum, and R. J. Pugmire, " Solid-State ^{13}C NMR Characterization of Matched Tars and Chars From Rapid Coal Devolatilization," Proceedings of the Combustion Institute, **28** (in press, 2000).
44. Hong, J., W. C. Hecker, and T. H. Fletcher, "Modeling High Pressure Char Oxidation Using Langmuir Kinetics with an Effectiveness Factor, " Proceedings of the Combustion Institute, **28** (in press, 2000).
43. Perry, S., T. H. Fletcher, R. J. Pugmire, M. S. Solum, "A Global Free-Radical Mechanism for Light Gas Nitrogen Release from Coal during Devolatilization," *Energy & Fuels*, **14**, 1094-1102 (2000).
42. Hong, J., W. C. Hecker, and T. H. Fletcher, "Improving the Accuracy of Predicting Effectiveness Factors for m-th Order and Langmuir Rate Equations in Spherical Coordinates," *Energy and Fuels*, **14**, 663-670 (2000).
41. Veranth, J. M., T. H. Fletcher, D. W. Pershing, and A. F. Sarofim, "Measurement of Soot and Char in Pulverized Coal Fly Ash," *Fuel*, **79**(9), 1067-1075 (2000).
40. Flores, D. V. and T. H. Fletcher, "The Use of Two Mixture Fractions to Treat Coal Combustion in Turbulent Pulverized-Coal Flames," *Combustion Science and Technology*, **150**, 1-26 (2000).
39. Genetti, D. and T. H. Fletcher, "Modeling Nitrogen Release during Devolatilization on the Basis of Chemical Structure of Coal," *Energy and Fuels*, **13**, 1082-1091 (1999).
38. Genetti, D., T. H. Fletcher, and R. J. Pugmire, "Predicting ^{13}C NMR Measurements of the Chemical Structure of Coal Based on Elemental Composition and Volatile Matter Content," *Energy and Fuels*, **13**, 60-68 (1999).
37. Mallampalli, H., T. H. Fletcher, and J. Y. Chen, "Evaluation of CH_4/NO_x Reduced Mechanisms Used for Modeling Lean Premixed Turbulent Combustion of Natural Gas," *Journal of Engineering for Gas Turbines and Power*, **120**, 703-712 (1998).

36. Brown, A. L. and T. H. Fletcher, “Modeling Soot Derived from Pulverized Coal,” *Energy and Fuels*, **12**, 745-757 (1998).
35. Kelemen, S. R., M. L. Gorbaty, P. J. Kwiatek, T. H. Fletcher, M. Watt, M. S. Solum, and R. J. Pugmire, "Nitrogen Transformations in Coal during Pyrolysis," *Energy and Fuels*, **12**, 159-173 (1998).
34. Fletcher, T. H., J. Ma, J. R. Rigby, A. L. Brown, and B. W. Webb, "Soot in Coal Combustion Systems," *Progress in Energy and Combustion Science*, **23**, 283-301 (1997).
33. Baxter, L. L., R. E. Mitchell, and T. H. Fletcher, "Release of Inorganic Material During Coal Devolatilization," *Combustion & Flame*, **4**, 494-502 (1997).
32. Ma, J., T. H. Fletcher, and B. W. Webb, "Conversion of Coal Tar to Soot During Coal Pyrolysis in a Post-Flame Environment," *Twenty-Sixth Symposium (International) on Combustion*, The Combustion Institute, Pittsburgh, PA, 3161-3167 (1996).
31. Watt, M., T. H. Fletcher, S. Bai, M. S. Solum, and R. J. Pugmire, "Chemical Structure of Coal Tar During Devolatilization," *Twenty-Sixth Symposium (International) on Combustion*, The Combustion Institute, Pittsburgh, PA, 3153-3160 (1996).
30. Chen, W., L. D. Smoot, S. C. Hill, and T. H. Fletcher, “Part 2. A Global Rate Expression for Nitric Oxide Reburning,” *Energy and Fuels*, **10**, 1046-1052 (1996).
29. Chen, W., L. D. Smoot, T. H. Fletcher, and R. D. Boardman, “Part 1. A Computational Method for Determining Global Fuel-NO Rate Expressions”, *Energy and Fuels*, **10**, 1036-1045 (1996).
28. Gale, T. K., C. H. Bartholomew, and T. H. Fletcher, “Effects of Pyrolysis Heating Rate on Intrinsic Reactivities of Coal Chars,” *Energy and Fuels*, **10**, 766-755 (1996).
27. Baxter, L. L., R. E. Mitchell, T. H. Fletcher, and R. E. Mitchell, "Nitrogen Release during Coal Combustion," *Energy and Fuels*, **10**, 188-196 (1996).
26. Ma, J., T. H. Fletcher, and B. W. Webb, “Thermophoretic Sampling of Coal-Derived Soot Particles During Devolatilization,” *Energy and Fuels*, **9**, 802-808 (1995).
25. Gale, T. K., T. H. Fletcher, and C. H. Bartholomew, "Effects of Pyrolysis Conditions on Internal Surface Areas and Densities of Coal Chars Prepared at High Heating Rates in Reactive and Non-Reactive Atmospheres," *Energy and Fuels*, **9**, 513-524 (1995).
24. Gale, T. K., C. H. Bartholomew, and T. H. Fletcher, "Decreases in the Swelling and Porosity of Bituminous Coals During Devolatilization at High Heating Rates," *Combustion and Flame* , **100**, 94-100 (1995).
23. Solomon, P. R. and T. H. Fletcher, "The Impact of Pyrolysis in Combustion," an invited review paper, *Twenty-Fifth Symposium (International) on Combustion*, 463-474 (1994).
22. Fletcher, T. H. and S. C. Hill, "An Overview of ACERC Comprehensive Model Development," *Energy and Fuels*, **7**:6, 870-873 (1993).
21. Pugmire, R. J. and T. H. Fletcher, "An Overview of ACERC Research in Fuel Characterization and Reaction Mechanisms," *Energy and Fuels*, **7**:6, 700-703 (1993).
20. Fletcher, T. H., S. Bai, R. J. Pugmire, M. S. Solum, S. Woods, and D. M. Grant, "Chemical Structural Features of Pyridine Extracts of the Argonne Premium Coals Using ^{13}C NMR Spectroscopy," *Energy and Fuels*, **7**:6, 734-742 (1993).
19. Fletcher, T. H., "Swelling Properties of Coal Chars During Rapid Coal Pyrolysis and Combustion," *Fuel* , **72**:11, 1485-1495 (1993).
18. Hurt, R. H., T. H. Fletcher, and R. S. Sampaio, "Heat Transfer from a Molten Phase to an Immersed Coal Particle During Devolatilization," *ASME Journal of Heat Transfer* , **155**:3, 717-723 (1993).

17. Solomon, P. R., T. H. Fletcher, and R. J. Pugmire, "Progress in Coal Pyrolysis," *Fuel* , **72**:5, 587-597 (1993).
16. Fletcher, T. H., M. S. Solum, D. M. Grant, and R. J. Pugmire, "Chemical Structure of Char in the Transition from Devolatilization to Combustion," *Energy and Fuels,* **6**, 644-650 (1992).
15. Fletcher, T. H., A. R. Kerstein, R. J. Pugmire, M. S. Solum, and D. M. Grant, "A Chemical Model of Coal Devolatilization: 3. Direct Use of ^{13}C NMR Data to Predict Effects of Coal Type," *Energy and Fuels*, **6**(4), 414-431 (1992).
14. Pugmire, R. J., M. S. Solum, D. M. Grant, S. Critchfield, and T. H. Fletcher, "Structural Evolution of Matched Tar/Char Pairs in Rapid Pyrolysis Experiments," *Fuel* , **70**, 414-423 (1991).
13. Fletcher, T. H., M. S. Solum, D. M. Grant, S. Critchfield, and R. J. Pugmire, "Solid-State ^{13}C and ^{1}H NMR Studies of the Evolution of the Chemical Structure of Coal Char and Tar During Devolatilization," *Twenty-Third Symposium (International) on Combustion*, The Combustion Institute, Pittsburgh, PA, p. 1231 (1990).
12. Fletcher, T. H., A. R. Kerstein, R. J. Pugmire, and D. M. Grant, "Chemical Percolation Model for Devolatilization: II. Temperature and Heating Rate Effects on Product Yields," *Energy and Fuels*, **4**, 54 (1990).
11. Fletcher, T. H., "Time-Resolved Particle Temperature and Mass Loss Measurements of a Bituminous Coal During Devolatilization," *Combustion and Flame,* **78**, 223 (1989).
10. Fletcher, T. H., "Time-Resolved Temperature Measurements of Individual Coal Particles During Devolatilization," *Combustion Science and Technology* **63**, 89 (1989).
9. Grant, D. M., R. J. Pugmire, T. H. Fletcher, and A. R. Kerstein, "A Chemical Model of Coal Devolatilization Using Percolation Lattice Statistics," *Energy and Fuels*, **3**, 175 (1989).
8. Baxter, L. L., Fletcher. T. H., and Ottesen, D. K., "Spectral Emittance of Coal Particles," *Energy and Fuels*, **2**, 423 (1988).
7. Dudek, D. R., T. H. Fletcher, J. P. Longwell, and A. F. Sarofim, "Natural Convection Induced Drag Forces on Spheres at Low Grashof Numbers: Comparison of Theory with Experiment," *International Journal of Heat and Mass Transfer*, **31**:4, 863-873 (1988).
6. Smith, P. J. and T. H. Fletcher, "A Study of Two Chemical Reaction Models in Turbulent Coal Combustion," *Combustion Science and Technology*, **58**, 59-76 (1988).
5. Niksa, S., A. R. Kerstein, and T. H. Fletcher, "Predicting Devolatilization at Typical Coal Combustion Conditions with the Distributed-Energy Chain Model," *Combustion and Flame*, **69**, 221-228 (1987).
4. Holve, D. J., T. H. Fletcher, and K. Gomi, "Comparative Combustion Studies of Ultrafine Coal/Water Slurries and Pulverized Coal," *Combustion Science and Technology*, **52**, 269-291 (1987), Sandia Report SAND85-8706 (May 1985).
3. Suzuki, T., L. D. Smoot, T. H. Fletcher, and P. J. Smith, "Prediction of High-Intensity Pulverized Coal Combustion," *Combustion Science and Technology*, **45**, 167-183 (1986).
2. Musarra, S. P., T. H. Fletcher, S. Niksa, and H. A. Dwyer, "Heat and Mass Transfer in the Vicinity of a Devolatilizing Coal Particle," *Combustion Science and Technology*, **45**, 289-307 (1986).
1. Smith, P. J., T. H. Fletcher, and L. D. Smoot, "Model for Coal-Fired Reactors," *Eighteenth Symposium (International) on Combustion,* The Combustion Institute, Pittsburgh, PA, p. 1285 (1980).

M.S. Thesis and Ph.D. Dissertation

1. Fletcher, T. H., "Theoretical Modeling of Reacting Coal Particles in Pulverized Coal Combustion and Gasification," M.S. Thesis, Chemical Engineering Department, Brigham Young University (December, 1980).
2. Fletcher, T. H., "A Two-Dimensional Model for Coal Gasification and Combustion," Ph.D. Dissertation, Chemical Engineering Department, Brigham Young University (August, 1983).

Other Published Papers and Reports
(not peer-reviewed)

1. Hedman, P. O., L. D. Smoot, T. H. Fletcher, P. J. Smith, and A. U. Blackham, "Prediction and Measurement of Entrained Flow Coal Gasification Processes," Interim Report Volume I prepared for U.S. DOE/METC, Contract No. DE-AC21-81MC16518, Combustion Laboratory, Brigham Young University (October, 1983).
2. Smith, P. J., L. D. Smoot, and T. H. Fletcher, "User's Manual for a Computer Program for 2-Dimensional Coal Gasification or Combustion (PCGC-2)," Interim Report Volume II prepared for U.S. DOE/METC, Contract No. DE-AC21-81MC16518, Combustion Laboratory, Brigham Young University (October, 1983).
3. Smoot, L. D., T. H. Fletcher, and K. R. Christensen, "Data Book: For Evaluation of Pulverized Coal Reaction Models," Interim Report Volume III prepared for U.S. DOE/METC, Contract No. DE-AC21-81MC16518, Combustion Laboratory, Brigham Young University (1984).
4. Smith, P. J., T. H. Fletcher, L. L. Baxter, and L. D. Smoot, "Coal-Water Mixtures Combustion Modeling," Final Report for U.S. DOE/ METC Contract No. DE-AC21-83MC20182, Combustion Laboratory, Brigham Young University (December, 1984).
5. Dudek, D. and T. H. Fletcher, "Numerical Calculation of the Drag Force Induced by Natural Convection on Spheres at Low Grashof Numbers," Sandia Report SAND87-8201, available NTIS (February, 1987).
6. Fletcher, T. H., A. R. Kerstein, R. J. Pugmire, M. S. Solum, and D. M. Grant, "A Chemical Percolation Model for Devolatilization: Milestone Report," Sandia report SAND92-8207, available NTIS (May, 1992). (72 pages, not peer-reviewed external to Sandia)
7. Fletcher, T. H. and D. R. Hardesty, "Compilation of Sandia Coal Devolatilization Data: Milestone Report," for DOE/PETC under contract FWP 0709, Sandia Report No. SAND92-8209, available NTIS (May, 1992). (338 pages, not peer-reviewed external to Sandia)
8. Fletcher, T. H., T. Brady, W. Reade, and J. N. Harb, "Fuel Characterization Tests," Final Report for TRW P.R. No. GE4471 (August, 1993).

Presentations at ACERC Meetings
(Papers required and published in the ACERC Annual Report)

1. Pugmire, R. J. and T. H. Fletcher, "An Overview of Thrust Area 1," presented at the 9th Annual ACERC Conference, Provo, Utah (April 5-6, 1995).

2. Fletcher, T. H., T. K. Gale, and C. H. Bartholomew, "Changes in Diameter and Surface Areas of Chars During Pyrolysis at Heating Rates, Temperatures, and Steam Concentrations Typical of Commercial Combustion Environments," presented at the 9th Annual ACERC Conference, Provo, Utah (April 5-6, 1995).
3. Hill, S. C. and T. H. Fletcher," Overview of Thrust Area 5," presented at the 9th Annual ACERC Conference, Provo, Utah (April 5-6, 1995).
4. Chen, W., Smoot, L. D., S. C. Hill, and T. H. Fletcher, "An Improved NO_X submodel with Reburning," presented at the 9th Annual ACERC Conference, Provo, Utah (April 5-6, 1995).
5. Watt, M. and T. H. Fletcher, "Coal Nitrogen Chemistry in Coal," poster presented at the 9th Annual ACERC Conference, Provo, Utah (April 5-6, 1995).
6. Pugmire, R. J., T. H. Fletcher, and D. B. Genetti, "Predicting ^{13}C NMR Measurements Based on Coal Elemental Composition," poster presented at the 9th Annual ACERC Conference, Provo, Utah (April 5-6, 1995).
7. Fletcher, T. H., J. Ma, B. W. Webb, and J. Rigby, "Soot in Coal Combustion," poster presented at the 9th Annual ACERC Conference, Provo, Utah (April 5-6, 1995).
8. Flores, D. V. and T. H. Fletcher, "A Two Mixture Fraction Approach for Modeling Turbulent Combustion of Coal Volatiles and Char Oxidation Products," poster presented at the 9th Annual ACERC Conference, Provo, Utah (April 5-6, 1995).
9. Hedman, P. O., T. H. Fletcher, S. Schmidt, C. Phillips, R. Dawson, J. Haslam, R. Murray, and H. Mallampalli, "Advanced Gas Turbine Systems (ATS) Research Program," poster presented at the 9th Annual ACERC Conference, Provo, Utah (April 5-6, 1995).
10. Fletcher, T. H., J. Ma, J. Rigby, and B. W. Webb, "Understanding the Role of Soot in Coal Combustion," presented at the 10th Annual ACERC Conference, Provo, Utah (March 6-8, 1996).
11. Watt, M., E. Hambly, D. Genetti, and T. H. Fletcher, "Nitrogen Release During Coal Devolatilization," poster presented at the 10th Annual ACERC Conference, Provo, Utah (March 6-8, 1996).
12. Fletcher, T. H., J. Ma, J. Rigby, and B. W. Webb, "Understanding the Role of Soot in Coal Combustion," presented at the 10th Annual ACERC Conference, Provo, Utah (March 6-8, 1996).
13. Brown, A. L., D. V. Flores, and T. H. Fletcher, "Model Improvements in PCGC-3," poster presented at the 10th Annual ACERC Conference, Provo, Utah (March 6-8, 1996).
14. Hedman, P. O., T. H. Fletcher, R. W. Dawson, D. V. Flores, J. K. Haslalm, K. B. Kinghorn, H. P. Mallampalli, R. L. Murray, and C. G. Phillips, "Advanced Gas Turbine System (ATS) Research Program, poster presented at the 10th Annual ACERC Conference, Provo, Utah (March 6-8, 1996).
15. Fletcher, T. H. and D. Genetti, "Predicting ^{13}C NMR Measurements of the Chemical Structure of Coal Based on Proximate and Ultimate Analysis," oral and poster presentation at the 11th Annual ACERC Conference, Provo, Utah (March 12-13, 1997).
16. Fletcher, T. H. and S. C. Hill, "Research Advances in Comprehensive Modeling," presented at the 11th Annual ACERC Conference, Provo, Utah (March 12-13, 1997).
17. Hambly, E., D. Genetti, S. Perry, and T. H. Fletcher, "Nitrogen Release During Coal Devolatilization," poster presented at the 11th Annual ACERC Conference, Provo, Utah (March 12-13, 1997).
18. Brown, A. and T. H. Fletcher, "Modeling Soot in Coal Combustion," poster presented at the 11th Annual ACERC Conference, Provo, Utah (March 12-13, 1997).

19. Fletcher, T. H. and A. Brown, “Modeling Soot in Pulverized Coal Flames,” oral presentation at the 12th Annual ACERC Conference, Provo, Utah (March 25-26, 1998).
20. Hambly, E. and T. H. Fletcher, “Solid-State ^{13}C NMR Analysis of Coal Tar,” poster presentation at the 12th Annual ACERC Conference, Provo, Utah (March 25-26, 1998).
21. Genetti, D. B. and T. H. Fletcher, “Chemical Percolation Devolatilization Model (CPD),” poster presentation at the 12th Annual ACERC Conference, Provo, Utah (March 25-26, 1998).
22. Perry, S. T. and T. H. Fletcher, “Use of Chemical Structural Char Data to Better Understand Nitrogen Release Chemistry,” poster presentation at the 12th Annual ACERC Conference, Provo, Utah (March 25-26, 1998).
23. Zhang, H. and T. H. Fletcher, “Char Oxidation during Late Burnout,” poster presentation at the 12th Annual ACERC Conference, Provo, Utah (March 25-26, 1998).
24. Hong, J. and T. H. Fletcher, “High Pressure Char Oxidation Modeling,” poster presentation at the 12th Annual ACERC Conference, Provo, Utah (March 25-26, 1998).
25. Fletcher, T. H. and D. Genetti, "Advancements in Modeling Coal Pyrolysis Based on Chemical Structure," oral presentation at the 13th Annual ACERC Conference, Provo, Utah (February 25-26, 1999).
26. Hong, J. and T. H. Fletcher, "Analytical Expressions for Predicting the Effectiveness Factor for the mth Order and Langmuir Rate Equations in Spherical Coordinates," poster presented at the 13th Annual ACERC Conference, Provo, Utah (February 25-26, 1999).
27. Genetti, D. and T. H. Fletcher, "An Advanced Model for Coal Nitrogen Pyrolysis Based on Chemical Structure," poster presented at the 13th Annual ACERC Conference, Provo, Utah (February 25-26, 1999).
28. Perry, S. T., and T. H. Fletcher, "A Global Mechanisms for Nitrogen Release during Primary Coal Devolatilization," poster presented at the 13th Annual ACERC Conference, Provo, Utah (February 25-26, 1999).
29. Zhang, H. and T. H. Fletcher, "Nitrogen Transformations during Secondary Coal Pyrolysis," poster presented at the 13th Annual ACERC Conference, Provo, Utah (February 25-26, 1999).
30. Fletcher, T. H., S. T. Perry, R. J. Pugmire, and M. S. Solum, "A Global Free-Radical Mechanism for Nitrogen Release during Coal Devolatilization Based on Chemical Structure," oral presentation at the 14th Annual ACERC Conference, Salt Lake City, Utah (February 17-18, 2000).
31. Hedman, P. O. and T. H. Fletcher, "Observations of Flame Behavior in a Laboratory-Sclae Premixed Natural Gas/Air Gas Turbine Combustor: Planar Laser Induced Fluorescence (PLIF) of OH," oral presentation at the 14th Annual ACERC Conference, Salt Lake City, Utah (February 17-18, 2000).
32. Pugmire, R. J., M. S. Solum, H. Zhang, and T. H. Fletcher, "Soot Characterization by Solid-State NMR," oral presentation at the 14th Annual ACERC Conference, Salt Lake City, Utah (February 17-18, 2000).
33. Fletcher, T. H. and D. Clayton, "Decomposition of Low-Density Polyurethan Foam at High Pressure," poster presented at the 14th Annual ACERC Conference, Salt Lake City, Utah (February 17-18, 2000).
34. Hong, J., W. C. Hecker, and T. H. Fletcher, "Modeling Char Oxidation at Atmospheric and Elevated Pressures using an Intrinsic Langmuir Rate Equation and an Effectiveness Factor," poster presented at the 14th Annual ACERC Conference, Salt Lake City, Utah (February 17-18, 2000).

35. Parker, J. T., T. H. Fletcher, R. E. Winans, and S. Seifert, "Small Angle X-Ray Scattering Study of Coal Soot Formation," poster presented at the 14th Annual ACERC Conference, Salt Lake City, Utah (February 17-18, 2000).

Student M.S. Theses

1. Flores, D. V., "The Use of Two Mixture Fractions to Treat Coal Combustion Products in Turbulent Pulverized-Coal Flames," M.S. Thesis, Chemical Engineering Department, Brigham Young University (April, 1996).
2. Watt, M., "The Chemical Structure of Coal Tar and Char During Devolatilization," M.S. Thesis, Chemical Engineering Department, Brigham Young University (August, 1996).
3. Mallampalli, H., "Evaluation of CH_4/NO Global Mechanisms Used for Modeling Lean Premixed Turbulent Combustion of Natural Gas," M.S. Thesis, Chemical Engineering Department, Brigham Young University (August, 1996).
4. Brown, Alexander L., "Modeling Soot in Pulverized Coal Flames," M.S. Thesis, Mechanical Engineering Department, Brigham Young University (August, 1997).
5. Hambly, Eric M., "The Chemical Structure of Coal Char and Tar during Devolatilization," M.S. Thesis, Chemical Engineering Department, Brigham Young University (April, 1998).
6. Genetti, D. B., "An Advanced Model of Coal Devolatilization Based on Chemical Structure," M.S. Thesis, Mechanical Engineering Department, Brigham Young University (April, 1999).

Student Ph.D. Dissertations

1. Ma, J., "Soot Formation During Coal Pyrolysis," Ph.D. Dissertation, Chemical Engineering Department, Brigham Young University (August, 1996).
2. Perry, S. T., "A Global Free-Radical Mechanism for Nitrogen Release during Coal Devolatilization Based on Chemical Structure," Ph.D. Dissertation, Chemical Engineering Department, Brigham Young University (December, 1999).
3. Hong, J., "Modeling Char Oxiadtion as a Function of Pressure Using an Intrinsic Langmuir Rate Equation," Ph.D. Dissertation, Chemical Engineering Department, Brigham Young university (April, 2000).

Presentations at Technical Meetings
(requiring associated paper unless stated; ACERC meetings listed separately)

1. Fletcher, T. H., P. J. Smith, and L. D. Smoot, "Evaluation of a 2-D Coal Combustion Model," 1984 Spring Meeting of the Western States Section of the Combustion Institute, Boulder, Colorado (April, 1984).
2. Fletcher, T. H., P. J. Smith, L. L. Baxter, and L. D. Smoot, "Coal-Water Mixtures Modeling," First Annual Heat Engines Contractor's Meeting, U.S. DOE/METC, Morgantown, West Virginia (May, 1984).

3. Baxter, L. L., T. H. Fletcher, P. J. Smith, and L. D. Smoot, "Coal-Water Mixtures Combustion Model," 1984 Fall Meeting of the Western States Section of the Combustion Institute, Palo Alto, California (October, 1984).
4. Brown, B. W., K. B. Christensen, T. H. Fletcher, P. O. Hedman, P. J. Smith, and L. D. Smoot, "Modeling and Experimental Studies of An Entrained Flow Gasifier," presented at the AIChE 1984 Annual Meeting, San Francisco, California (November 25-30, 1984).
5. Holve, D. J., K. Gomi, and T. H. Fletcher, "Comparative Combustion Studies of Ultrafine Coal/Water Slurries and Pulverized Coal," presented at the Seventh International Symposium on Coal Slurry Fuels Preparation and Utilization, New Orleans, Louisiana (May 21-24, 1985).
6. Musarra, S. P., T. H. Fletcher, S. Niksa, and H. A. Dwyer, "Heat and Mass Transfer in the Vicinity of a Devolatilizing Coal Particle," presented at the 23rd ASME/AIChE National Heat Transfer Conference, Denver, Colorado (August, 1985).
7. Fletcher, T. H., "Sensitivity of Combustion Calculations to Devolatilization Rate Expressions," presented at the 1985 Fall Meeting of the American Flame Research Committee, Sandia National Laboratories, Livermore, California (October 17-18, 1985).
8. Holve, D. J., J. Hoornstra, and T. H. Fletcher, "The Influence of Size Distribution Characteristics in Heterogeneous Combustion," presented at the 1985 Fall Meeting of the American Flame Research Committee, Sandia National Laboratories, Livermore, California (October 17-18, 1985).
9. Smith, P. J. and T. H. Fletcher, "A Study of Two Chemical Reaction Models in Turbulent Coal Combustion," presented at the 1985 Fall Meeting of the Western States Section of the Combustion Institute, Davis, California (October 21-22, 1985).
10. Smith, P. J. and T. H. Fletcher, "A Study of Two Chemical Reaction Models in Turbulent Coal Combustion," presented at the ASME 107th Winter Annual Meeting (1986).
10. Niksa, S., A. R. Kerstein, and T. H. Fletcher, "Predicting Devolatilization at Typical Coal Combustion Conditions with the Distributed-Energy Chain Model," American Chemical Society Division of Fuel Chemistry Preprints, **31**:3, 237, Anaheim, California (September, 1986)
11. Niksa, S., A. R. Kerstein, and T. H. Fletcher, "Predicting Devolatilization at Typical Coal Combustion Conditions with the Distributed-Energy Chain Model," presented at the 2nd ASME/JSME Thermal Engineering Joint Conference, Honolulu, Hawaii (March, 1987).
12. Baxter, L. L., D. K. Ottesen, and T. H. Fletcher, "Spectral Emission Characteristic of Coal Particles," presented at the 1987 Spring Meeting of the Western States Section of the Combustion Institute, Provo, Utah (April, 1987).
13. Fletcher, T. H., Baxter, L. L., and Ottesen, D. K., "Spectral Emissivities of Size-Graded Coal Particles: Implications for Pyrometry," *1987 International Conference on Coal Science*, ed. Moulijn, J. A., Nater, K. A. , and Chermin, H. A. G., Elsevier, New York, p. 945 (1987).
14. Fletcher, T. H., L. L. Baxter, and D. K. Ottesen, "Spectral Emission Characteristics of Size-Graded Coal Particles," ACS Division of Fuel Chemistry preprints, **32**:3, 42-50, New Orleans, Louisiana (1987).
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