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### **Publication List**

#### **Books**

1. Gray, M.R. *Upgrading Petroleum Residues and Heavy Oils*, Marcel Dekker, New York, April 1994, 348 pp.

#### **Refereed Journal Papers:**

(The corresponding author is noted with an asterisk)

1. Kirkwood, K.M.; Ebert, S.; Foght, J.M.; Fedorak, P.M.; Gray, M.R.\* "Bacterial Biodegradation of Aliphatic Sulfides Under Aerobic Carbon- or Sulfur-Limited Growth Conditions", *Journal of Applied Microbiology*, 31 pp, accepted for publication, May 2005.
2. Asprino, O.J.; Elliott, J.A.W.; McCaffrey, W.C.; Gray, M.R.\* "Fluid Properties of Asphaltenes at 310 – 530 °C", *Energy and Fuels*, 27 pp, accepted for publication, April 2005.
3. Akbarzadeh, K.; Bressler, D.C.; Wang, J.; Gawrys, K.L.; Gray, M.R.\*; Kilpatrick, P.K.; Yarranton, H.W. "Association Behavior of Pyrene Compounds as Models for Asphaltenes", *Energy and Fuels* 19, 1268-1271 (2005).
4. Abdallah, W.A.; Nelson, A.E.; Gray, M.R. "Pyridine Adsorption and Decomposition on Mo(110) and C/N-Mo(110): Experiment and Modeling", *Surface Science*, 569, 193-206 (2004).
5. Dorobantu, L.S.; Yeung, A.K.C.; Foght, J.M.; Gray, M.R.\* "Stabilization of Oil/Water Emulsions by Hydrophobic Bacteria", *Applied and Environmental Microbiology*, 70, 6333-6336 (2004).
6. Gray, M.R.\*; Assenheimer, G.; Boddez, L.; McCaffrey, W.C. "Melting and Fluid Behavior of Asphaltene Films at 200-500 °C", *Energy and Fuels*, 18, 1419-1423 (2004).
7. Sheremata, J.M.; Gray, M.R.; Dettman, H.D.; McCaffrey, W.C.\* "Quantitative Molecular Representation and Sequential Optimization of Athabasca Asphaltenes", *Energy and Fuels*, 18, 1377-1384 (2004).
8. Kanda, W.S.; Siu, I.; Adjaye, J.; Nelson, A.E.; Gray, M.R.\* "Inhibition and Deactivation of Hydrodenitrogenation Catalysts by Narrow-Boiling Fractions of Athabasca Coker Gas Oil", *Energy and Fuels*, 18, 539-546 (2004).
9. Van Hamme, J.D.\*; Fedorak, P.M., Foght, J.M., Gray, M.R.; Dettman, H.D. "The use of a novel fluorinated organosulfur compound to isolate bacteria capable of carbon-sulfur bond cleavage". *Applied and Environmental Microbiology*, 70, 1487-1493 (2004).
10. Miyata, N.\*; Iwahori, K.; Foght, J.M.; Gray, M.R. "Saturable, Energy-Dependent Uptake of Phenanthrene in Aqueous Phase by *Mycobacterium* sp. Strain RJGII-135", *Applied and Environmental Microbiology*, 70, 363-369 (2004).
11. Gray, M.R.\*; McCaffrey, W.C.; Huq, I.; Le, T. "Kinetics of Cracking and Devolatilization During Coking of Athabasca Residues", *Industrial and Engineering Chemistry Research*, 43, 5438-5445 (2004).
12. Aminu, M.O.; Elliott, J.A.W.; McCaffrey, W.C.; Gray, M.R.\* "Fluid Properties at Coking Process Conditions", *Industrial and Engineering Chemistry Research* 12, 2929-2935 (2004).
13. Knapper, B.A.\*; Gray, M.R.; Chan, E.W.; Mikula, R. "Measurement of Efficiency of Distribution of Liquid Feed in a Gas-Solid Fluidized Bed Reactor" *International Journal of Chemical Reactor Engineering*, 1, A35. <http://www.bepress.com/ijcre/vol1/A35>, (2003).

14. Hearn, E.M.; Dennis, J.J.; Gray, M.R.; Foght, J.M.\* "Identification and characterization of the emhABC efflux system for polycyclic aromatic hydrocarbons in *Pseudomonas fluorescens* cLP6a", *Journal of Bacteriology*, 185, 6233-6240 (2003).
15. Gray, M.R.\* "Consistency of Asphaltene Chemical Structures with Pyrolysis and Coking Behavior", *Energy and Fuels*, 17, 1566-1569 (2003).
16. Rahmani, S.; McCaffrey, W.C.; Elliott, J.A.W. and Gray, M.R.\* "Liquid Phase Behavior During Cracking of Asphaltenes," *Industrial and Engineering Chemistry Research*, 42, 4101-4108 (2003).
17. Karimi Lotfabad, S.; Gray, M.R.\* "Transport and Reaction Processes in Bioremediation of Organic Contaminants. 2. Role of Aggregate Size in Soil Remediation in a Slurry Bioreactor," *International Journal of Chemical Reactor Engineering*, 1, A19 (2003). <http://www.bepress.com/ijcre/vol1/A19>
18. Rahmani, S.; McCaffrey, W.C.; Dettman, H.D. and Gray, M.R.\* "Coking kinetics of asphaltenes as a function of chemical structure" *Energy and Fuels*, 17, 1048-1056 (2003).
19. Gray, M.R.\*; Zhang, Z.; McCaffrey, W.C.; Huq, I.; Boddez, L.; Xu, Z.; Elliott, J.A.W. "Measurement of Adhesive Forces During Coking of Athabasca Vacuum Residue" *Industrial and Engineering Chemistry Research*, 42, 3549-3554 (2003).
20. Van Hamme, J.D.\*; Wong, E.T.; Dettman, H.D.; Gray, M.R.; Pickard, M.A. "Dibenzyl sulfide metabolism by white rot fungi". *Applied and Environmental Microbiology*, 69, 1320-1324 (2003).
21. Aoyagi, K., McCaffrey, W.C.; Gray, M.R.\* "Kinetics of Hydrocracking and Hydrotreating of Coker and Oilsands Gas Oils", *Petroleum Science and Technology*, 21, 997-1015 (2003).
22. Gray, M.R.\*; McCaffrey, W.C.; Srinivasan, N.; Chung, K. "Trapping of Aromatic Compounds During Coking of Athabasca Vacuum Residue", *Energy and Fuels*, 17, 282-284 (2002).
23. Karimi Lotfabad, S.; Gray, M.R.\* "Kinetics of biodegradation of mixtures of polycyclic aromatic hydrocarbons". *Applied Microbiology and Biotechnology*, 60, 361-365 (2002).
24. Bressler, D.C.; Gray, M.R.\* "Hydrotreating chemistry of model products from bioprocessing of carbazoles" *Energy and Fuels*, 16, 1076-1086 (2002).
25. Gray, M.R.\*; Srinivasan, N.; Masliyah, J.H. "Pressure Buildup in Gas-Liquid Flow Through Packed Beds Due to Deposition of Fine Particles", *Canadian Journal of Chemical Engineering*, 80, 346-354 (2002).
26. Kim, I.S.; Foght, J.M.; Gray, M.R.\* "Selective Transport and Accumulation of Alkanes by *Rhodococcus erythropolis* S+14He", *Biotechnology and Bioengineering*, 80, 650-659 (2002).
27. Gray, M.R.\*; McCaffrey, W.C. "Role of chain reactions and olefin formation in cracking, hydroconversion and coking of petroleum and bitumen fractions." *Energy and Fuels*, 16, 756-766 (2002).
28. Japanwala, S.; Dettman, H.D.; Chung, K.; Gray, M.R.\* "Quality of distillates from repeated recycle of residues", *Energy and Fuels*, 16, 477-484 (2002).
29. Rahmani, S., McCaffrey, W.C., Gray, M.R.\* "Kinetics of solvent interactions with asphaltenes during coke formation", *Energy and Fuels*, 16, 148-154 (2002).
30. Parsons, T.G., Masliyah, J.H., Gray, M.R.\* "Solid-Liquid Mass Transfer in a Rotary Drum", *Canadian Journal of Chemical Engineering*, 79, 726-731 (2001).
31. Dutta, R.P., McCaffrey, W.C.\*; Gray, M.R., Muehlenbachs, K. "Use of <sup>13</sup>C Tracers to Determine Mass-Transfer Limitations on Thermal Cracking of Thin Films of Bitumen", *Energy and Fuels*, 15, 1087-1093 (2001).
32. Gray, M.R.\*; Le, T.; McCaffrey, W.C.; Berruti, F.; Soundararajan, S.; Chan, E.; Huq, I. "Coupling of mass transfer and reaction in coking of thin films of Athabasca vacuum residue". *Industrial and Engineering Chemistry Research*, 40, 3317-3324 (2001).
33. Yan, N.; Gray, M.R.; Masliyah, J.H.\* "On water in oil emulsions stabilized by fine solids", *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 193, 97-107 (2001).
34. Gray, M.R.\*; Bugg, T. "Selective biocatalysis in bacteria controlled by active membrane transport", *Industrial and Engineering Chemistry Research*, 40, 5126-5131 (2001).
35. Zhao, Y.; Gray, M.R.\*; Chung, K. "Molar Kinetics and Selectivity in Cracking of Athabasca Asphaltenes" *Energy and Fuels*, 15, 751-755 (2001).
36. Wang, S.; Chung, K.; Gray, M.R.\* "Role of hydrotreating products in deposition of fine particles in reactors", *Fuel* 80, 1079-1085 (2001).
37. Bugg, T.; Foght, J.M.; Pickard, M.A.; Gray, M.R.\* "Uptake and Active Efflux of Polycyclic Aromatic Hydrocarbons by *Pseudomonas fluorescens* LP6a", *Applied and Environmental Microbiology*, 66, 5387-5392 (2000).

38. Gray, M.R.\*; Banerjee, D.K.; Dudas, M.J., Pickard, M.A. "Protocols to enhance biodegradation of hydrocarbon contaminants in soil", *Bioremediation Journal* 4, 249-257 (2000).
39. Chen, P.; Pickard, M.A.; Gray, M.R.\* "Surfactant inhibition of bacterial growth on solid anthracene", *Biodegradation*, 11, 341-347 (2000).
40. Karimi Lotfabad, S.; Gray, M.R.\* "Characterization of contaminated soils using confocal scanning laser microscopy and cryogenic scanning electron microscopy". *Environmental Science and Technology*, 34, 3408-3414 (2000).
41. Dutta, R.P.; McCaffrey, W.C.\*; Gray, M.R. ; K. Muehlenbachs "Thermal cracking of Athabasca bitumen: Influence of steam on reaction chemistry", *Energy and Fuels* 14, 671-676 (2000).
42. Yan, N.; Maham, Y.; Masliyah, J.H.\*; Gray, M.R.; Mather, A.E. "Measurement of contact angles for fumed silica nanospheres using enthalpy of immersion data". *Journal of Colloid and Interface Science* 228, 1-6 (2000).
43. Gray, M.R.\*; Zhao, Y.; McKnight, C.M. "Coke and minerals removal from bitumen hydroconversion catalysts", *Fuel* 79, 285-294 (2000).
44. Wang, S.; Chung, K.H.; Masliyah, J.H.; Gray, M.R.\* "Deposition of Fine Particles in Packed Beds at Hydrotreating Conditions: Role of Surface Chemistry". *Industrial and Engineering Chemistry Research* 38, 4878-4888 (1999).
45. Jauhari, R.; Gray, M.R.\*; Holloway, J.G. "Growth of *Rhizobium leguminosarum* on Peat in Rotating Bioreactors", *Canadian Journal of Chemical Engineering* 77, 911-916 (1999).
46. Gray, M.R.\*; Zhao, Y.; McKnight, C.M.; Komar, D.A.; Carruthers, J.D.; "Coking of Hydroprocessing Catalyst by Residue Fractions of Bitumen", *Energy and Fuels* 13, 1037-1045 (1999).
47. Stelmack, P.L.; Gray, M.R.\*; Pickard, M.A. "Bacterial adhesion to soil contaminants in the presence of surfactants". *Applied and Environmental Microbiology* 65, 163-168 (1999).
48. Nagaishi, H.; Ikeda, K.; Kitano, K.; Chan, E.W.; Gray, M.R. "Observation of heavy oil vaporization under rapid heating." *Energy and Fuels* 12, 1174-1180 (1998).
49. Chung, K.H.\*; Xu, S.; Gray, M.R.; Zhao, Y.; Kotlyar, L.; Sparks, B. "The chemistry, reactivity and processability of Athabasca bitumen pitch." *Reviews in Process Chemistry and Engineering* 1, 41-79 (1998).
50. Wang, S.; Chung, K.; Masliyah, J.H.; Gray, M.R.\* "Toluene-insoluble fraction from thermal cracking of Athabasca gas oil: Formation of a liquid-in-oil emulsion that wets hydrophobic dispersed solids." *Fuel* 77, 1647-1653 (1998).
51. Rutherford, P.M.; Banerjee, D.K.; Luther, S.M.; Gray, M.R.\*; Dudas, M.J.; McGill, W.B.; Pickard, M.A.; Salloum, M.J "Slurry-Phase Bioremediation of Creosote- and Petroleum-Contaminated Soils". *Environmental Technology* 19, 683-696 (1998).
52. Khorasheh, F.\*; Khaledi, R.; Gray, M.R. "Computer generation of representative molecules for heavy hydrocarbon mixtures". *Fuel* 77, 247-253 (1998).
53. Jauhari, R.; Gray, M.R.\*; Masliyah, J.H. "Gas-solid mass transfer in a rotary drum". *Canadian Journal of Chemical Engineering* 76, 224-231 (1998).
54. Narayan, R.; Coury, J.R.; Masliyah, J.H., Gray, M.R.\* "Particle trapping and plugging in packed-bed reactors". *Industrial and Engineering Chemistry Research* 36, 4620-4627 (1997).
55. Richardson, S.M.; Gray, M.R.\* "Enhancement of residue hydroprocessing catalysts by doping with alkali metals". *Energy and Fuels* 11, 1119-1126 (1997).
56. Willumsen, B.; Gray, M.R.\*; Dudas, M.J. "Biological degradation of anthracene in soil after sorption from non-aqueous phase liquids". *Environmental Technology* 18, 755-762 (1997).
57. Tanabe, K.; Gray, M.R.\* "Role of fine solids in the coking of vacuum residues". *Energy and Fuels* 11, 1040-1043 (1997).
58. Ayasse, A.R.; Nagaishi, H.; Chan, E.W.; Gray, M.R.\* "Lumped kinetics of hydrocracking of bitumen". *Fuel* 76, 1025-1033 (1997).
59. Rutherford, P.M.; Gray, M.R.\*; Dudas, M.J. "Desorption of <sup>14</sup>C-naphthalene from bioremediated and non-bioremediated soils contaminated with creosote compounds". *Environmental Science and Technology* 31, 2515-2519 (1997).
60. Gudi, R.D.; Shah, S.L.\*; M.R. Gray, M.R.; Yegneswaran, P.K. "Multirate Estimation and Control of Nutrient Levels in a fed-batch fermentation using off-line and on-line measurements". *Canadian Journal of Chemical Engineering* 75, 562-573 (1997).

61. Lu, G.Z.; Bittorf, K.; Thompson, B.G.; Gray, M.R.\* "Liquid circulation and mixing in an inclined bubble column". *Canadian Journal of Chemical Engineering* 75, 290-298 (1997).
62. Ngo, L.Y.; Tam, Y.K.\*; Tawfik, S.; Coutts, R.T.; Gray, M.R. "Effects of intravenous infusion of lidocaine on its pharmacokinetics in conscious instrumented dogs". *Journal of Pharmaceutical Sciences* 86, 944-952 (1997).
63. Nagaishi, H.; Chan, E.W.; Sanford, E.C.; Gray, M.R.\* "Kinetics of High-Conversion Hydrocracking of Bitumen". *Energy and Fuels* 11, 402-410 (1997).
64. Banerjee, D.K.; Gray, M.R.\* "Analysis of hydrocarbon contaminated soil by thermal extraction-gas chromatography". *Environmental Science and Technology* 31, 646-650 (1997).
65. Richardson, S.M.; Nagaishi, H.; Gray, M.R.\* "Initial coke deposition on a Ni-Mo/Al<sub>2</sub>O<sub>3</sub> bitumen hydroprocessing catalyst". *Industrial and Engineering Chemistry Research* 35, 3940-3950 (1996).
66. Karimi Lotfabad, S.; Pickard, M.A.; Gray, M.R.\* "Reactions of polynuclear aromatic hydrocarbons on soil". *Environmental Science and Technology* 30, 1145-1151 (1996).
67. Eckert, W.F.; Masliyah, J.H.\*; Gray, M.R.; Fedorak, P.M. " Prediction of sedimentation and consolidation of fine tails". *AIChE J.* 42, 960-972 (1996).
68. Sanford, E.C.\*; Steer, J.G.; Muehlenbachs, K.; Gray, M.R. "Residuum hydroconversion with Ni-Mo/Al<sub>2</sub>O<sub>3</sub> catalysts: Stable hydrogen and carbon isotope studies on hydrogenation and catalyst deactivation". *Energy and Fuels* 9, 928-935 (1995).
69. Gray, M.R.\*; Ayasse, A.R.; Chan, E.W.; Veljkovic, M. "Kinetics of desulfurization of thiophenic and sulfide sulfur in Athabasca bitumen". *Energy and Fuels* 9, 500-506 (1995).
70. Theriault, Y.; Masliyah, J.H.; Fedorak, P.M.; Vazquez-Duhalt, R.; Gray, M.R.\* "The effect of chemical, physical and enzymatic treatments on the dewatering of tar sands tailings". *Fuel* 74, 1404-1412 (1995).
71. Gudi, R.D.; Shah, S.L.\*; Gray, M.R. "Adaptive multirate state and parameter estimation strategies with application to a bioreactor" *AIChE J.* 41, 2451-2464 (1995).
72. Roberts, R.M.; Gray, M.R., Thompson, B.G.; Kresta, S.M.\* "The effect of impeller and tank geometry on circulation time distributions in stirred tanks." *Trans. Inst. Chemical Engineers*, 73, Part A, 78-86 (1995).
73. Lu, G.Z.; Thompson, B.G.; Suresh, M.R.; Gray, M.R.\* "Cultivation of hybridoma cells in an inclined bioreactor." *Biotechnology and Bioengineering* 45, 176-186 (1995).
74. Banerjee, D.K.; Fedorak, P.M.; Hashimoto, A.; Masliyah, J.H.; Pickard, M.A.; Gray, M.R.\* "Monitoring the biological treatment of anthracene-contaminated soil in a rotating-drum bioreactor." *Applied Microbiology and Biotechnology* 43, 521-528 (1995).
75. Kindziarski, W.B.; Fedorak, P.M.\*; Gray, M.R.; Hrudehy, S.E. "Activated carbon and synthetic resins as support material for methanogenic phenol-degrading consortia: Comparison of phenol-degrading activities". *Water Environment Research* 67, 108-117 (1995).
76. Gudi, R.D.; Shah, S.L.\*; Gray, M.R. "Multirate state and parameter estimation in an antibiotic fermentation with delayed measurements". *Biotechnology and Bioengineering* 44, 1271-1278 (1994).
77. Husband, D.L.; Masliyah, J.H.; Gray, M.R.\* "Cell and surfactant separation by column flotation". *Canadian Journal of Chemical Engineering* 72, 840-847 (1994).
78. Hussain, M.D.; Tam, Y.K.\*; Gray, M.R.; Coutts, R.T. "Kinetic interactions of lidocaine, diphenhydramine and verapamil with diltiazem: A study using isolated perfused rat liver". *Drug Metabolism and Disposition* 22, 530-536 (1994).
79. Munoz, V.A.; Ghorpadkar, S.V.; Gray, M.R.\* "Characterization of coke on spent hydroprocessing catalysts by optical microscopy". *Energy and Fuels* 8, 426-434 (1994).
80. Masliyah, J.H.\*; Jauhari, R.; Gray, M.R. "Drag coefficients for air bubbles rising along an inclined surface". *Chem. Eng. Sci.* 49, 1905-1911 (1994).
81. Khorasheh, F.; Gray, M.R.\* "Thermal hydrocracking of n-hexadecane in benzene". *Energy and Fuels* 8, 507-512 (1994).
82. Gray, M.R.\*; Banerjee, D.K.; Fedorak, P.M.; Hashimoto, A.; Masliyah, J.H.; Pickard, M.A. "Biological remediation of anthracene-contaminated soil in rotating bioreactors." *Applied Microbiology and Biotechnology* 40, 933-940 (1994).
83. Hussain, M.D.; Tam, Y.K.\*; Gray, M.R.; Coutts, R.T. "Mechanisms of time-dependent kinetics of diltiazem in the isolated-perfused rat liver." *Drug Metabolism and Disposition* 22, 36-42 (1994).
84. Khorasheh, F.; Gray, M.R.\* "High-pressure thermal cracking of n-hexadecane in tetralin". *Energy and Fuels* 7, 960-967 (1993).

85. Khorasheh, F.; Gray, M.R.\* "High-pressure thermal cracking of n-hexadecane". *Industrial and Engineering Chemistry Research* 32, 1853-1863 (1993).
86. Khorasheh, F.; Gray, M.R.\* "High-pressure thermal cracking of n-hexadecane in aromatic solvents". *Industrial and Engineering Chemistry Research* 32, 1864-1876 (1993).
87. Gray, M.R.\*; Mehta, B.; Masliyah, J.H. "Liquid-side mass transfer coefficients for liquids and slurries in a rotating drum". *Chemical Engineering Science* 48, 3442-3445 (1993).
88. Namdev, P.K.; Irwin, N.C.; Thompson, B.G.; Gray, M.R.\* "Effect of oxygen fluctuations on recombinant *Escherichia coli* fermentation". *Biotechnology and Bioengineering* 41, 666-670 (1993).
89. Namdev, P.K.; Thompson, B.G.; Gray, M.R.\* "Effects of glucose fluctuations on synchrony in fed-batch fermentations of *Saccharomyces cerevisiae*". *Biotechnology Progress* 8, 501-507 (1992).
90. Lu, G.Z.; Thompson, B.G.; Gray, M.R.\* "Physical modeling of animal cell damage by hydrodynamic forces in suspension cultures". *Biotechnology and Bioengineering* 40, 1277-1281 (1992).
91. Steer, J.G.; Muehlenbachs, K.; Gray, M.R.\* "Stable isotope analysis of hydrogen transfer during catalytic hydrocracking of residues". *Energy and Fuels* 6, 540-544 (1992).
92. Craik, S.A.; Fedorak, P.M.; Hrudey, S.E.; Gray, M.R.\* "Kinetics of methanogenic degradation of phenol by activated-carbon supported and granular biomass". *Biotechnology and Bioengineering* 40, 777-786 (1992).
93. Kindziarski, W.B.; Gray, M.R.; Fedorak, P.M.; Hrudey, S.E.\* "Activated carbon and synthetic resins as support material for methanogenic phenolic-degrading consortia - comparison of surface characteristics and initial colonization". *Water Environment Research* 64, 766-775 (1992).
94. Gray, M.R.\*; Khorasheh, F.; Wanke, S.E.; Achia, U.; Krzywicki, A.; Sanford, E.C.; Sy, O.K.Y.; Ternan, M. "The role of catalyst in hydrocracking of residues from Alberta bitumens". *Energy and Fuels* 6, 478-485 (1992).
95. Jokuty, P.L.; Gray, M.R.\* "Nitrogen bases resistant to hydrodenitrogenation: Evidence against using quinoline as a model compound". *Industrial and Engineering Chemistry Research* 31, 1445-1449 (1992).
96. Bloemkolk, J.W.; Merchant, F.; Mosmann, T.R.; Gray, M.R.\* "Effect of temperature on hybridoma cell cycle and MAB production". *Biotechnology and Bioengineering* 40, 427-431 (1992).
97. Namdev, P.K.; Thompson, B.G.; Gray, M.R.\* "The effect of feed zone in fed-batch fermentations of *Saccharomyces cerevisiae*". *Biotechnology and Bioengineering* 40, 235-246 (1992).
98. Jokuty, P.L.; Gray, M.R.\* "Resistant nitrogen compounds in hydrotreated gas oil from Athabasca bitumen". *Energy and Fuels* 5, 791-795 (1991).
99. Craik, S.A.; Gray, M.R.; Hrudey, S.E.; Fedorak, P.M.\* "Thermogravimetric determination of biomass on activated carbon". *Environmental Technology* 12, 489-496 (1991).
100. Saville, B.A.\*; Gray, M.R.; Tam, Y.K. "Experimental studies of transient mass transfer and reaction in the liver: Interpretation with a heterogeneous compartment model". *J. Pharmaceutical Sciences* 81, 265-271 (1992).
101. Yegneswaran, P.K.; Thompson, B.G.; Gray, M.R.\* "Experimental simulation of dissolved oxygen fluctuations in large fermentors: Effect on *Streptomyces clavuligerus*". *Biotechnology and Bioengineering* 38, 1203-1209 (1991).
102. Yegneswaran, P.K.; Thompson, B.G.; Gray, M.R.\* "Effect of dissolved oxygen control on growth and antibiotic production from *Streptomyces clavuligerus* fermentations". *Biotechnology Progress* 7, 246-250 (1991).
103. Choi, J.H.K.; Gray, M.R.\* "Identification of nitrogen compounds and amides from spent hydroprocessing catalyst". *Fuel Processing Technology* 28, 77-93 (1991).
104. Gray, M.R.\*; Jokuty, P.; Yeniova, H.; Nazarewycz, L.; Wanke, S.E.; Achia, U.; Krzywicki, A.; Sanford, E.C.; Sy, O.K.Y. "The relationship between chemical structure and reactivity of Alberta bitumens and heavy oils". *Can. J. Chem. Eng.* 69, 833-843 (1991).
105. Ke, J.; Tam, Y.K.\*; Koo, W.W.K.; Gray, M.R.; Coutts, R.T. "Effects of parenteral nutrition on hepatic elimination of lidocaine: A study using the isolated perfused rat liver". *J. of Pharmacology and Experimental Therapeutics* 255, 351-356, 1990.
106. Namdev, P.K.; Yegneswaran, P.K.; Thompson, B.G.; Gray, M.R.\* "Experimental simulation of large-scale bioreactor environments using a Monte Carlo method". *Can. J. Chem. Eng.* 69, 513-519, 1991.
107. Egiebor, N.O.\*; Gray, M.R. "Evidence for methane activation during coal pyrolysis and liquefaction". *Fuel* 69, 1276-82 (1990).

108. Gray, M.R.\*; Tam, Y.K. "Pharmacokinetics of drugs which inactivate metabolic enzymes". *J. Pharmaceutical Sciences* 80, 121-127 (1991).
109. Trytten, L.C.; Gray, M.R.\*; Sanford, E.C. "Hydroprocessing of narrow-boiling gas oil fractions: Dependence of reaction kinetics on molecular weight". *Industrial and Engineering Chemistry Research* 29, 725-730 (1990).
110. Yegneswaran, P.K.; Gray, M.R.\*; Thompson, B.G. "Kinetics of CO<sub>2</sub> hydration in fermentors: pH and pressure effects". *Biotechnology and Bioengineering* 36, 92-96 (1990).
111. Gray, M.R. "Lumped kinetics of structural groups: Hydrotreating of heavy distillate". *Industrial and Engineering Chemistry Research* 29, 505-512 (1990).
112. Tam, Y.K.\*; Ke, J.; Coutts, R.T.; Wyse, D.G.; Gray, M.R. "Quantification of three lidocaine metabolites and their conjugates". *Pharmaceutical Research* 7, 504-507 (1990).
113. Trytten, L.C.; Gray, M.R.\* "Estimation of hydrocracking of C-C bonds during hydroprocessing of oils". *Fuel* 69, 397-399 (1990).
114. Khorasheh, F.; Rangwala, H.A.; Gray, M.R.\*; Dalla Lana, I.G. "Interactions between thermal and catalytic reactions in mild hydrocracking of gas oil". *Energy & Fuels* 3, 716-722 (1989).
115. Khorasheh, F.; Gray, M.R.; Selucky, M.L.\* "A correlation for Kovats retention index of C<sub>9</sub> to C<sub>26</sub> monoalkyl and polymethyl alkanes and alkenes". *J. Chromatography* 481, 1-16 (1989).
116. Kirchen, R.P.\*; Sanford, E.C.; Gray, M.R.; George, Z.M. "Coking of Athabasca bitumen derived feedstocks". *AOSTRA J. Research* 5, 225-235 (1989).
117. Egiebor, N.O.; Gray, M.R.\*; Cyr, N. "<sup>13</sup>C-NMR characterization of organic residues on spent hydroprocessing, hydrocracking, and demetallization catalysts". *Applied Catalysis*, 55, 81-91 (1989).
118. Saville, B.A.; Gray, M.R.\*; Tam, Y.K. "Evidence for lidocaine-induced enzyme inactivation". *J. Pharmaceutical Sciences* 78, 1003-1008 (1989).
119. Zou, J.; Gray, M.R.\*; Thiel, J. "Structural changes in Cold Lake bitumen due to *in situ* combustion". *AOSTRA J. Research* 5, 75-86 (1989).
120. Gray, M.R.\*; Khorasheh, F.; Dalla Lana, I.G.; Yeniova, H. "Correlation of reactivity with chemical structure: Thermal hydrogenation of gas oils". *Can. J. Chem. Eng.* 67, 628-634 (1989).
121. Gray, M.R.\*; Choi, J.H.K.; Egiebor, N.O.; Kirchen, R.P.; Sanford, E.C. "Structural group analysis of residues from Athabasca bitumen". *Fuel Science and Technology International* 7, 599-610 (1989).
122. Egiebor, N.O.; Gray, M.R.\*; Cyr, N. "<sup>13</sup>C-NMR of solid organic deposits on spent hydroprocessing catalysts". *Chem. Eng. Communications* 77, 125-133 (1989).
123. Yegneswaran, P.K.; Gray, M.R.\*; Westlake, D.W.S. "Effect of reduced oxygen on growth and antibiotic production in *Streptomyces clavuligerus*". *Biotechnology Letters* 10, 479-484 (1988).
124. Egiebor, N.O.; Jacobson, J.M.; Gray, M.R.\*; Lee, L.K. "Structural group analysis of products from two-stage liquefaction of Highvale coal". *Fuel Science and Technology International* 7, 251-279 (1989).
125. Choi, J.H.K.; Gray, M.R.\* "Structural analysis of extracts from spent hydroprocessing catalysts". *Industrial and Engineering Chemistry Research* 27, 1587-1595 (1988).
126. Jacobson, J.M.; Gray, M.R.\*; Chambers, A.K.; Thiel, J. "Structural compositions of tars from hydropyrolysis of coal. Effect of reaction severity". *Energy & Fuels* 2, 316-320 (1988).
127. Thiel, J.; Gray, M.R.\* "NMR spectroscopic characteristics of Alberta bitumens". *AOSTRA J. Research* 4, 63-73 (1988).
128. Tam, Y.K.\*; Tawfik, S.R.; Ke, J.; Coutts, R.T.; Gray, M.R. "HPLC of lidocaine and nine of its metabolites in human plasma and urine". *J. Chromatography, Biomedical Applications* 423, 199-206 (1987).
129. West, M.B.; Gray M.R.\* "Pyrolysis of 1,3-butanediol as a model reaction for wood liquefaction in supercritical water". *Can. J. Chem. Eng.* 65, 645-650 (1987).
130. Jacobson, J.M.; Gray, M.R.\* "The use of infrared spectroscopy and nitrogen titration data in structural group analysis of bitumen". *Fuel* 66, 749-752 (1987).
131. Jacobson, J.M.; Gray, M.R.\* "Structural group analysis of changes in Peace River bitumen caused by thermal recovery". *Fuel* 66, 753-757 (1987).
132. Gray, M.R.\*; Tam, Y.K. "A series-compartment model for hepatic elimination". *Drug Metabolism and Disposition* 15, 27-31 (1987).
133. Khorasheh, F.; Gray, M.R.\*; Dalla Lana, I.G. "Structural changes in catalytic processing of Syncrude coker gas oil". *Can. J. Chem. Eng.* 65, 166-170 (1987).

134. Khorasheh, F.; Gray, M.R.\*; Dalla Lana, I.G. "Structural analysis of Alberta heavy gas oils". *Fuel* 66, 505-511 (1987).
135. Tam, Y.K.\*; Yau, M.; Berzins, R.; Montgomery, P.R.; Gray, M.R. "Mechanisms of lidocaine kinetics in the isolated perfused rat liver: I. Effects of continuous infusion". *Drug Metabolism and Disposition* 15, 12-16 (1987).
136. Saville, B.A.; Gray, M.R.\*; Tam, Y.K. "Mechanisms of lidocaine kinetics in the isolated perfused rat liver: II. Mathematical model for steady-state elimination". *Drug Metabolism and Disposition* 15, 17-21 (1987).
137. Gray, M.R.\*; Saville, B.A.; Tam, Y.K. "Mechanisms of lidocaine kinetics in the isolated perfused rat liver: III. Evaluation of liver models for time-dependent behavior". *Drug Metabolism and Disposition* 15, 22-26 (1987).
138. Saville, B.A.; Gray, M.R.\*; Tam, Y.K. "The metabolism of lidocaine in the liver: Steady-state and dynamic modelling". *Can. J. Chem. Eng.* 64, 617-624 (1986).
139. Gray, M.R.\*; Corcoran, W.H.; Gavalas, G.R. "Pyrolysis of a wood derived material: The effects of moisture and ash content". *Industrial and Engineering Chemistry, Process Design and Development* 24, 646-651 (1985).
140. Allen, D.T.\*; Gray, M.R.; Le, T.T. "Structural characterization and thermodynamic property estimation for wood tars: A functional group approach". *Liquid Fuels Technology* 2, 327-353 (1984).