

Ewellyn A. Capanema
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ACADEMIC CREDENTIALS

Federal University of Minas Gerais	Belo Horizonte, MG, Brazil
• PhD – Science-Chemistry	1999
• Masters Degree – Chemistry	1993
• Bachelors Degree – Chemistry	1986

PROFESSIONAL EXPERIENCE

North Carolina State University Department of Wood and Paper Science Raleigh, NC Research Assistant Professor	August 2009- present
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North Carolina State University Department of Wood and Paper Science Raleigh, NC Research Associate	Feb 2001- August 2009
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Emphasis:

- Enzyme application in wood chemistry
- Plant biopolymer separation characterization
- Biorefinery, Pulping and bleaching chemistry
- Catalysis of pulp delignification

North Carolina State University Department of Wood and Paper Science Raleigh, NC Visiting Scholar	Sept 1996- Sept 1999
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Emphasis:

- Lignin oxidation – Laccase-Mediator system
- Lignin isolation and analysis
- Mechanisms of lignocellulosic processing
- Kinetic studies - Oxidative ammonolysis of technical lignins
- Delignification efficiency and residual lignin structure

Federal University of Minas Gerais Chemistry Department Belo Horizonte, MG, Brazil Assistant Professor - PhD Student	Mar 1991- Sept 1993
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Assistantship Emphasis:

Organic chemistry I – Experimental techniques, methods of separation, identification and purification of organic compounds

Organic chemistry II – Synthesis and characterization of organic molecules

Doctoral Academic Emphasis:

Methodology for isolation of individual compounds

Synthesis and analysis of organic molecules

PROFESSIONAL ACTIVITIES

- *Areas of Interest and accomplishments*

The understanding and development of biobased solutions to economic and environmental issues is at the core of much of my research. The focus has been on the integrated utilization of plant biomass through a comprehensive understanding of the underlying fundamentals. Therefore, **advance in analytical methodology** has been of primary importance of my research activity.

In the past 6 years I have attained approximately \$80 thousands and \$500 thousands in technical service funding and research funding as co-investigator. To date I have authored and co-authored eighteen published papers in five various peer-reviewed journals. Many of my publications have been targeted to the premier, high impact factor journals in my field (data from 2004), including *Holzforschung* (1.014 impact factor - #2) and the *Journal of Agriculture and Food Chemistry* (2.322 impact factor - #1) which consistently rank among the highest impact factors of all the Materials Science (Paper & Wood) and Agriculture Journals, respectively.

- ***Grants awards:***
 - Aracruz Celulose, Espirito Santo, Brazil 2003. \$15,000.
 - Aracruz Celulose, Espirito Santo, Brazil 2005. \$9,000.
 - North Carolina Biotechnology Center-NCBC- (in collaboration with Whetten, R., Frampton, J., Hain, F.P., Peszlen, I.M, Balakshin, M.Y. and Van Zyl, L.M.) June 2005 – May 2007. \$250,000.
 - Lignol Innovations, Vancouver, Canada 2008. \$60,000.
 - Forest Biotechnology Industrial Research Consortium (FORBIRC) Correlation between hardwood LCC structure and pulping performance. (in collaboration with M. Balakshin, H. Jameel and H.-m. Chang. July 2008- August 2009. \$20,000.
 - Forest Biotechnology Industrial Research Consortium (FORBIRC) Correlation between wood morphology and pulping performance. (in collaboration with M. Balakshin, H. Jameel and H.-m. Chang. July 2009- August 2010. \$20,000.
 - Biofuels Center of North Carolina - (in collaboration with Park, S., Whetten, R., Mckeand, S., Isik, F., Phillips, R., Alex Berlin, Lignol Innovations) July 1st 2009 – July 30th 2010. \$303,325
- ***Editorship.***
 - 2006 – Present: O Papel Magazine, Brazil. Editorial Advisory Board
- ***Reviewer – Journals***
 - *Holzforschung*
 - *Journal of Agricultural and food Chemistry*

- Journal of the Science of Food and Agriculture
- Molecules
- Journal of Wood Chemistry and Technology
- **Conference Participation (Organizer, etc.)**
 - 2008-present – International Congress and Exhibition (ABTCP-PI) Sao Paulo, Brazil (Symposium co-organizer)
 - 2009- American Chemical Society-National Meeting; Salt Lake City, Utah, USA (Session Chair)
- **Invited Lectures-** Recipient of seven esteemed speaking invitations including lectures in Japan and China.
 - June 1999: Forestry and Forest Product Research Institute, Tsukuba, Japan
 - March 2007: Nagoya University, Japan
 - March 2007: Forestry and Forest Product Research Institute, Tsukuba, Japan
 - March 2007: Wood Chemistry Laboratory, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan
 - October 2008: Wood Chemistry Laboratory, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan
 - November 2008: Department of Paper Science & Technology, College of Chemical engineering, Nanjing Forestry University, China.
 - March 2009: Kitami Institute of Technology, Kitami, Hokkaido, Japan
- **Professional Memberships**
 - American Chemical Society- CELL division
 - Brazilian Chemical Society-SBQ, Division of Organic Chemistry

COLLABORATIONS

Collaborated in thirteen various research studies with colleagues at North Carolina State University, The University of Tokyo, University of British Columbia, Federal University of Minas Gerais, University of Hamburg, Germany and others. Refer to resume supplement for citations.

- Aracruz Cellulose S/A (Dr. Otávio Mambrin)
- Lignol Innovations Ltd (Dr. Alex Berlin)
- Bruker BioSpin Corporation (Dr. Kimberly L. Colson)
- University of British Columbia, UBC (Dr. John Kadla)
- Tokyo University, Japan (Dr. Yuji Matsumoto)
- Department of Forestry and Environmental Resources at North Carolina State University (Prof. Ross Whetten)
- Department of Horticultural Science at North Carolina State University (Prof. Paul V. Nelson)
- Department of Crop Science at North Carolina State University (Prof. Daniel C. Bowman)
- Nuclear Magnetic Resonance Laboratory at Chemistry Department at North Carolina State University (Dr. Hanna Gracz)
- Escola de Veterinária, Universidade Federal de Minas Gerais, Belo Horizonte, Minas Gerais (Prof. Eloisa Saliba)

- Department of Forest Chemical Products, Saint- Petersburg State Forest Technical Academy at Saint- Petersburg, Russia (Prof. Ivan Deineko)
- Laboratório de Polpação e Papel, Universidade Federal de Viçosa, Viçosa, Minas Gerais (Prof. José Lívio Gomide e Prof. Jorge Luis Colodette)

TECHNICAL SKILLS

Equipment:

- Perkin-Elmer FT-IR Model 16 PC spectrometer with Data Processing Station
- HP Perkin-Elmer Lambda 3B UV-VIS Spectrophotometer with Data Processing Station
- ThermoFinnigan Trace GC/MS/MS spectrometer
- Hewlett-Packard Model 6890 and GCD Gas Chromatograph with HP 7673A Automatic Sampler and HP ChemStation
- Hewlett-Packard Model 5890A Gas Chromatograph with HP 7673A Automatic Sampler and HP 5895 GC Workstation
- Bruker AVANCE 500 MHz Spectrometer (1996) / Oxford Narrow Bore Magnet (1989) equipped with Three Channel Gradient Control Unit (GRASP III), Variable Temperature Unity, Pre-Cooling and Temperature Stabilization Unit, 5 mm ID 3 Channel Tripl-Axis Gradient Probe among others
- Bruker 300 MHz NMR spectrometer with 1D and 2D capabilities equipped with a broad band inverse detection (BBI) and quadrupole (1H, 13C, 31P, 19F) probes
- Dionex LC- Ion Chromatograph Model DX 500, IC3000
- Foss NIRSystems near-infrared spectrometer equipped with an InTact Single Tablet Module (NR-1650) and a monochromator (NR-6500-V/H)

Computer Skills: Windows Vista, Microsoft Office

PUBLICATIONS

PAPERS IN REFEREED JOURNALS. *Authored and co-authored nineteen published papers in various journals from 2001 - 2009.*

1. M. Schmidt, A. M. Schwartzberg, P. N. Perera, A. Weber-Bargioni, A. Carroll, P. Sarkar, E. Bosneaga, J. J. Urban, P. D. Adams, **E.A. Capanema**, M. Balakshin, V. Chiang P. J. Schuck (2009). Label-free in situ imaging of differences in lignin content, localization and composition in the cell walls of wild type and transgenic *Populus trichocarpa*. *Planta* (2009) 230:589–597.
2. Balakshin, M.Yu., **Capanema, E.A.**, Chang, H.-m. A fraction of MWL with high concentration of lignin-carbohydrate linkages: Isolation and analysis with 2D NMR spectroscopic techniques. *Holzforschung* 61 (2007) 1-7.
3. **Capanema, E.A.**, Balakshin, M.Yu., Kadla, J.F., Chang, H.-m. (2007). On isolation of milled wood lignin from eucalyptus wood. *O Papel*, May 2007 (N5), 74-79.
4. **Capanema, E.A.**, Balakshin, M.Yu., Yu, Q., McKeand, S.E., Li, B., Jameel, H., Chang, H.-m., Mullin, T.J. Chemical Properties in CAD-Deficient Pine and their Effect on Pulping. *O Papel*, June 2007 (N6), 86-94.

5. **Capanema, E.A.**, Balakshin, M.Yu., and Chen, C.-L. Oxidative Ammonolysis of Technical Lignins Part 4. Effect of NH₄OH Concentration and pH. *J. Wood Chem. Techn.*, 26(1) (2006) 95-109.
6. **Capanema, E.A.**, Balakshin, M.Yu., and Kadla, J.F. Quantitative Characterization of a Hardwood MWL by NMR Spectroscopy. *J. Agric. Food Chem.*: 2005, 53, 9639-9649.
7. Ting-Feng Yeh, Tatsuhiko Yamada, **Ewellyn Capanema**, Hou-Min Chang, Vincent Chiang, and John F. Kadla. Rapid Screening of Wood Chemical Component Variations Using Transmittance Near-Infrared Spectroscopy. *J. Agric. Food Chem.* **2005**, 53, 3328 – 3332.
8. Mikhail Yu. Balakshin, **Ewellyn A. Capanema**, Barry Goldfarb, John Frampton and John F. Kadla. NMR Studies on Fraser Fir Lignins. *Holzforschung*. **2005**.: 59, 488-496.
9. **Capanema, E.A.**, Balakshin, M.Yu., Chen, C.-L. An Improved Procedure for Isolation of Residual Lignins from Hardwood Kraft Pulps. *Holzforschung* 28, **2004**, 464-472
10. **Capanema, E.A.**, Balakshin, M. Yu., and Kadla, J.F. A comprehensive approach for quantitative lignin characterization by NMR spectroscopy. *J. Agric. Food Chem.* **2004**, 52, 1850-1860.
11. Balakshin, M.Yu., **Capanema, E.A.**, Chen, C.-L., and Gracz, H.S. Elucidation of the Structures of Residual and Dissolved Pine Kraft Lignins Using an HMQC NMR Technique. *J. Agric. Food Chem.* 51 **2003**, 6116-6127
12. Alves, Vera, **Capanema, Ewellyn A.**, Chen, Chen-Loung, Gratzl Josef. Comparative studies on oxidation of lignin model compounds with hydrogen peroxide using Mn(IV)-Me₃TACN and Mn(IV)-Me₄DTNE as catalyst. *J. Mol. Catalysis A* **2003**, 206:1-2, 37-51
13. Chen, Chen-Loung, **Capanema, Ewellyn A.**, Gracz Hanna S. Comparative studies on the delignification of pine kraft-Anthraquinone pulp with hydrogen peroxide by binucleus Mn(IV) complex catalysis. *J. Agric. Food Chem* **2003**, 51:21, 6223-6232
14. Chen, Chen-Loung, **Capanema, Ewellyn A.**, Gracz Hanna S. Reaction mechanism in delignification of pine kraft-AQ pulp with hydrogen peroxide using Mn(IV)-Me₄DTNE as catalyst. *J. Agric. Food Chem* **2003**, 51:7, 1932-1941
15. **Capanema, E.C.**, M. Yu. Balakshin, C.-L. Chen, J.S. Gratzl, and A.G. Kirkman. Oxidative Ammonolysis of Technical Lignins. Part 3. Effect of Temperature on the Reaction Rate. *Holzforschung* **2002**, 56:4, 402 – 415
16. **Capanema, E.C.**, M. Yu. Balakshin, C.-L. Chen, J.S. Gratzl, and A.G. Kirkman. Oxidative Ammonolysis of Technical Lignins. Part 2. Effect of Oxygen Pressure. *Holzforschung* **2001**, 55: 4, 405-412
17. **Capanema, E.C.**, M. Yu. Balakshin, C.-L. Chen, J.S. Gratzl, and A.G. Kirkman. Oxidative Ammonolysis of Technical Lignins. Part 1. Kinetics of the Reaction under Isothermal Condition at 130°C. *Holzforschung* **2001**, 55: 4, 397-404

18. Balakshin, M.Yu., **E.A. Capanema**, C.-L. Chen, J.S. Gratzl, A.G. Kirkman, and H.S. Gracz. Reaction of Lignin during Pulp Delignification with Laccase Mediator System. Journal of Molecular Catalysis, B: Enzymatic **2001**, 13/1-3, 1-16.
19. **Capanema, E.C.**, Balakshin, M.Yu., Chen, C-L., Gratzl, J.S. and Gracz, H.S “Structural Analysis of Residual and Technical Lignins by ^1H - ^{13}C Correlation 2D NMR-Spectroscopy”. Holzforschung: **2001** 55: 3, 302-308

BOOK CHAPTER

Balakshin, M.Yu., **Capanema, E.A.**, Chang, H.-m. Recent advances in isolation and analysis of lignins and lignin-carbohydrate complexes. In: Characterization of Lignocellulosics, Ed. T. Hu. Blackwell, Oxford UK 2008 p.: 148-166

PAPERS PRESENTED AT PROFESSIONAL CONFERENCES

Presented forty three papers at professional meetings in ten various countries from 1991 - 2008.

1. **Ewellyn A., Capanema**, Mikhail Y., Balakshin, Hou-min Chang, Hasan Jameel. Quantitative Analysis of technical Lignins by a Combination of ^1H - ^{13}C and ^{13}C NMR Methods. Proceedings of Intern. Conference on Pulping Papermaking and Biotechnology, Nanjing, China, November 2008, v. I 647-653.
2. S. S. Kelley, R. B. Phillips, **E. A. Capanema**, D. W. Hazel. Use of Near Infrared to Predict Composite Variations in Woody Biomass and the Effects of Compositional Variations on the Costs of Producing Biofuels. Proceedings of Intern. Conference on Pulping Papermaking and Biotechnology, Nanjing, China, November 2008, v. I 242-247.
3. Mikhail Y., Balakshin, **Ewellyn A., Capanema**, Hou-min Chang, Hasan Jameel, Nam hee Shim. Correlation between Hardwood Lignin Structure and Pulping Performance. Proceedings of Intern. Conference on Pulping Papermaking and Biotechnology, Nanjing, China, November 2008, v. I 380-385.
4. **Capanema, E.A.**, Balakshin, M.Yu., Katahira, R., Chang, H.-m., Jameel, H. (2007) Structural variations in hardwood lignins. Proc. 14th Intern. Symp. Wood Fibre Pulping Chem. CD-ROM. Durban, South Africa, June 25-28, 2007.
5. Balakshin, M.Yu., **Capanema, E.A.**, Chang, H.-m., Jameel, H. (2007) Structural variations in pine and birch lignin-carbohydrate complexes preparations. Proc. 14th Intern. Symp. Wood Fibre Pulping Chem. CD-ROM. Durban, South Africa, June 25-28, 2007.
6. Balakshin, M.Yu., **Capanema, E.A.**, Whetten, R., Frampton, J. Chemical profiling of bark extractives to understand the mechanism of host-pest interaction in Fraser fir infestation with BWA. Paper presented at the 2005 International Chemical Congress of Pacific Basin Societies, Honolulu, Hawaii, USA, December 15-20.
7. **Ewellyn A., Capanema**, Mikhail Y., Balakshin, Hou-min Chang. Advances in isolation and analysis of lignin-carbohydrate complexes. Paper presented at the 2005 International Chemical Congress of Pacific Basin Societies, Honolulu, Hawaii, USA, December 15-20.

8. Balakshin, M.Yu., **Capanema, E.A.** Selective lignin modification coupled with NMR spectroscopy: A method for lignin analysis. Proceedings of 13th ISWPC, May 16-19, **2005**, Auckland, New Zealand, v.II, 353-360. Oral presentation.
9. Mikhail Yu. Balakshin, **Ewellyn A. Capanema**, Barry Goldfarb, John Frampton and John F. Kadla. Effect of balsam woolly adelgid infestation on the structure of wood and bark Proceedings of 13th ISWPC, May 15-19, **2005**, Auckland, New Zealand, v. III, 33-40. Poster presentation.
10. **Ewellyn A. Capanema**, Mikhail Yu. Balakshin, Maryn L. Heerman, TingFeng Yeh, Qibin Yu, C. Dana Nelson, Steven E. McKeand, Bailian Li, Hasan Jameel, Hou-min Chang, and T.J. "Tim" Mullin Chemical Properties in CAD-Deficient Pine and their Effect on Pulping. Proceedings of 13th ISWPC, May 15-19, **2005**, Auckland, New Zealand, v. II, 173-180. Oral presentation.
11. **Capanema, E.A.**, Balakshin, M.Yu., Isolation and Characterization of Residual Lignins from Hardwood Pulps: Method Improvements. Proceedings of 13th ISWPC, May 15-19, **2005**, Auckland, New Zealand, v.III, 57-64. Poster presentation.
12. Yu, Q., **Capanema, E.**, Batista, V.B., Josserand, S., Johnson, G., Nelson, C.D., McKeand, S.E., MacKay, J.J., Kadla, J.F., Li, B., Jameel, H., Chang, H.-M., and Mullin, T.J. **2004**. Tracking down the effects of a rare mutant gene in loblolly pine, a first report. In: 2004 Paper Summit, Spring Technical and International Environmental Conference, May 3-5, 2004, Atlanta, GA, USA, CD-ROM published by TAPPI, Norcross, GA
13. Yu, Q., **Capanema, E.**, Nelson, C.D., McKeand, S.E., Li, B., Jameel, H., Chang, H.-M., and Mullin, T.J. 2004. Wood density, pulping and growth of partially CAD deficient loblolly pine in fertilized and non-fertilized treatments. Poster and abstract presented at 2004 IEG-40 Meeting: Advancing Regeneration Technologies for the Deployment of Elite Southern Pine Germplasm, 22-24 June **2004**, Jeckyll Island, GA
14. Yu, Q., **Capanema, E.**, Nelson, C.D., McKeand, S.E., Li, B., Jameel, H., Chang, H.-M., and Mullin, T.J. 2004. Potential value of partially CAD-deficient loblolly pine for the pulp and paper industry. Pp. 338 *In*: Li, Bailian and Steven McKeand, eds. Forest Genetics and Tree Breeding in the Age of Genomics: Progress and Future, IUFRO Joint Conference of Division 2, Conference Proceedings. 1-5 November **2004**, Charleston, SC.
15. **Capanema, E.A.**, Balakshin M.Yu., Kadla, J.F. Comprehensive Characterization of the Structures of Lignins. Paper presented at the **2003** AIChE Annual Meeting, November 16-21, San Francisco, CA.
16. Balakshin, M.Yu., **Capanema, E.A.**, Chen, C.-L. On the role of Na₂S in alkaline pulping. Proceedings of 12th ISWPC, June 9-12, **2003**, v.2, p. 121-124, Madison, USA,
17. **Capanema, E.A.**, Balakshin, M.Yu., Chen, C.-L., Colson, K.L. and Gracz, H.S. Use of Cryogenic NMR Probes in 13C and 1H-13C 2D NMR Techniques for Structural Analysis of Lignin Preparations. Proceedings of 12th ISWPC, June 9-12, 2003, v.1, p. 179-182, Madison, USA

18. **Capanema, Ewellyn A.**, Balakshin, Mikhail Y., Chen, Chen-Loung, Gracz, Hanna S. 2D NMR-HMQC technique: a powerful tool for structural analysis of lignins. Book of Abstracts, the 223th ACS National Meeting, Abstract No.: CELL 082, April 7-11, 2002, Publisher: American Chemical Society, Washington, D. C. CODEN: 69CKQP Conference.
19. Chen, Chen-Loung, **Capanema, Ewellyn A.**, Balakshin, Mikhail Y., Gracz, Hanna S. Elucidation of reaction mechanisms in TCF bleaching processes using 2D NMR-HMQC techniques. Abstracts of Papers, 223rd ACS National Meeting, Abstract No.: CELL-049, April 7-11, 2002, Orlando, FL, United States. Publisher: American Chemical Society, Washington, D. C. CODEN: 69CKQP Conference.
20. **E.A.Capanema**, M.Yu.Balakshin, C.-L.Chen and J.S.Gratzl. Oxidative ammonolysis of lignin: competitive and consecutive reactions. Proceedings 7th EWLP, August 26 -29, 2002, 47-50, Turku, Finland
21. **Capanema, E.A.**, M.Yu. Balakshin,V.L. Alves, C.-L. Chen, J.S. Gratzl, H.S.Gracz. Studies on the Mechanisms of Lignin Degradation in New Pulp Bleaching Techniques. 7th Brazilian Symposium on the Chemistry of Lignins and Other Wood Components (BSCLWC), 2001, pp.255-262, September 2-5, Minas Gerais, Brazil
22. **Capanema, E.A.**, M.Yu. Balakshin, C.-L. Chen, J.S. Gratzl H.S.Gracz. Studies on Kraft Pulp Lignins Using hmqc nmr Technique. 7th Brazilian Symposium on the Chemistry of Lignins and Other Wood Components (BSCLWC), 2001,pp. 61-68, September 2-5, Minas Gerais, Brazil
23. **Capanema, E.A.**, V.L. Alves, C.-L. Chen, J.S. Gratzl, and H.S.Gracz, R. Patt, J. Odermatt. Studies on reaction mechanism in Mn(IV)-complex-catalyzed bleaching of pulp with hydrogen peroxide by 2D NMR spectroscopy. Proc.: 11th ISWPC v.I 223-226, 2001, June 11-14, Nice, France
24. **Capanema, E.A.**, M.Yu. Balakshin, C.-L. Chen, J.S. Gratzl, and H.S.Gracz. Application of 1H-13C correlation 2D NMR technique in the structural studies of kraft lignins. Grenoble workshop on advanced methods for lignocellulosics and paper products characterization. 2001, pp. 35-38, June 18-19, Grenoble, France
25. Balakshin, M.Yu., **E.A. Capanema**, C.-L. Chen, J.S. Gratzl, and H.S.Gracz.. Studies of Reaction mechanism for delignification of pulp with dioxygen in the laccase-mediator systems by HMQC NMR technique. Proc. Grenoble workshop on advanced methods for lignocellulosics and paper products characterization. 2001, pp. 119-122 June 18-19, Grenoble, France
26. **Capanema, E.A.** M.Yu. Balakshin, C.-L. Chen, J.S. Gratzl, and A.G Kirkman. Mechanism and Kinetics Studies on Oxidative ammonolysis of technical lignins. Proc. 2000 TAPPI Pulping/Process & Product Quality Conference, November 5-8, 2000, Boston, MA. CD- ROM
27. **Capanema, E.A.** M.Yu. Balakshin, C.-L. Chen, J.S. Gratzl, and A.G Kirkman. Oxidative ammonolysis of technical lignins - Mechanism and Kinetics. Proc. the 4th

International Non- Wood Fiber Pulping and Papermaking Conference (INWFPPC), October 18-21, 2000, 52-57, Jinan, Shandong Province, P.R. China.

28. Balakshin, M.Yu., **E.A. Capanema**, C-L. Chen, J.S. Gratzl, A.G. Kirkman, and H.S. Gracz. The use of 2D NMR-spectroscopy on structural analysis of residual and technical lignins. Proc. the 6th European Workshop in Ligninocellulosic and Pulp (EWLP), v.1. 11-14, September 3-6, 2000, Bordeaux, France.
29. **Capanema, E.A.**, M.Yu. Balakshin, C.-L. Chen, J.S. Gratzl, and A.G Kirkman. Effect of variable on the kinetics of oxidative ammonolysis of technical lignins. Proc. 6th Brazilian Symposium on the Chemistry of Lignins and Other Wood Components (BSCLWC), October 25-28, 1999, São Paulo, Brazil.
30. **Capanema, E.A.**, M.Yu. Balakshin, C.-L. Chen, J.S. Gratzl, and A.G Kirkman, and H.S. Gracz. Studies on the Structure of Residual and Technical Lignins by ¹H-¹³C Correlation 2D NMR-Spectroscopy. Proc. 6th Brazilian Symposium on the Chemistry of Lignins and Other Wood Components (BSCLWC), October 25-28, 1999, São Paulo, Brazil
31. Balakshin, M.Yu., **E.A. Capanema**, C-L. Chen, J.S. Gratzl, A.G. Kirkman, and H.S. Gracz. Lignin reaction in pulp biobleaching with Laccase-Mediator System. Proc. 10th ISWPC, v.1. 572-577, June 7-10, 1999, Yokohama, Japan.
32. **Capanema, E.A.**, M.Yu. Balakshin, C.-L. Chen, J.S. Gratzl, and A.G Kirkman, and H.S. Gracz. Effect of temperature on the rate of oxidative ammonolysis and structures of N-modified lignins. Proc. 10th ISWPC, v.3. 404-409, June 7-10, 1999, Yokohama, Japan.
33. Balakshin, M.Y., **E.A. Capanema**, C.-L. Chen, J.S. Gratzl, and A.G Kirkman. Studies on the mechanism of pulp delignification with laccase-mediator system. Book of Abstracts, the 217th ACS National Meeting, Abstract No.: CELL 083, March 21-25, 1999, Anaheim, CA. Publisher: American Chemical Society, Washington, D. C CODEN: 67GHA6 Conference.
34. Balakshin, M.Y., **E.A. Capanema**, C.-L. Chen, J.S. Gratzl, and A.G Kirkman. The mechanism of lignin with laccase-mediator system. Book of Abstract, International Symposium in Advances in Wood Chemistry, Abstract No. 1, May 30-31, 1999, Vienna, Austria
35. **Capanema, E.A.**, M.Yu. Balakshin, C.-L. Chen, J.S. Gratzl, and A.G Kirkman. Studies on the mechanism of oxidative ammonolysis of technical lignins. Proc. 5th European Workshop on Lignocellulosics and Pulp (EWLP), v.1. 397-400, August 30-September 2, 1998, Aveiro, Portugal.
36. **Capanema, E.A.**, C.-L. Chen, J.S. Gratzl, and A.G Kirkman. Kinetic Studies on Oxidative Ammonolysis of Technical Lignin. Book of Abstracts, the 215th ACS National- Meeting, Abstract No. CELL 020, March 29-April 2, 1998, Dallas, TX. Publisher: American Chemical Society, Washington, D. C CODEN: 65QTAA Conference.

37. **Capanema, E.A.**, F. Carazza, and C.-L. Chen. Synthesis of benzyl-isoquinoline and isoquinoline alkaloids from Eucalyptus Tar Constituents. Book of Abstract, 4th Brazilian Symposium on the chemistry of lignins and other wood materials, Abstract No. W 17, September 3-5, 1995, Pernambuco, Brazil.
38. Motta, R.R., **E.A. Capanema**, F. Carazza, and C.-L. Chen. Brasileira de Química. "Preparação de derivados da homoveratrilamina". Book of Abstracts, 8th Brazilian Chemical Society Meeting, Abstract No.: P98, November 22-26, 1994, Belo Horizonte, Minas Gerais, Brazil.
39. **Capanema, E.A.**, F. Carazza, M.O.S. Pereira. Separação dos constituintes neutros da fração 180-240°C do alcatrão de Eucalyptus. Book of Abstracts 17th Brazilian Chemical Society National Meeting, Abstract No. TC10, May 20-24, 1994, Caxambu, MG, Brazil.
40. **Capanema, E.A.**, F. Carazza, and M.O.S. Pereira. Fractionation and HPGC-MS Analysis of Constituents of Eucalyptus Tar. Proc. 3rd Brazilian Symposium on the Chemistry of Lignins and Other Wood Components (BSCLWC), v.1. pp. 190-194, 1993, Minas Gerais, Brazil. CODEN: 61SGAL Conference.
41. **Capanema, E.A.**, F. Carazza, M.O.S. Pereira. Derivados furânicos e naftalênicos da fração 180-240°C do alcatrão de Eucalyptus. Book of Abstracts, 16th Brazilian Chemical Society National Meeting, Abstract No. TC-15, May 27-30, 1993, Caxambu, Minas Gerais, Brazil.
42. **Capanema, E.A.**, F. Carazza, and M.O.S. Pereira. Derivados da 2-ciclo-penten-1-ona presentes no alcatrão vegetal. Book of Abstracts, 6th Brazilian Chemical Society Meeting. Abstract No. P20, November 15-18, 1992, São João del Rei, Minas Gerais, Brazil.
43. **Capanema, E.A.**; F. Carazza, and M.O.S. Pereira. Constituintes neutros e fenólicos da fração que destila a 105°C do alcatrão de eucalyptus. Book of Abstracts, 5th Brazilian Chemical Society Meeting, Abstract No. P22, November 26-29, **1991**, Ouro Preto, Minas Gerais, Brazil.