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Invitation from the Organizing Committee

Improving the economics of producing fuels and chemicals is vital to many industrial sectors. We've designed the program for the 22nd Symposium on Biotechnology for Fuels and Chemicals to deliver the latest research breakthroughs and results in biotechnology that stimulate such improvements. Whether you represent the industrial, academic, or government sector, we invite you to join us and participate in this exciting exchange of information and ideas. You will not only find tremendous opportunity for productive interaction with your domestic colleagues, but since this symposium has an international scope, you will also gain from the results of research efforts abroad.

With the 22nd Symposium, we continue the tradition of providing an informal, congenial atmosphere that our participants find conducive to pursuing technical discussion of program topics. This year technical topics include:

Session 1. Feedstocks Production, Modification, & Characterization

Session 2. Applied Biological Research

Session 3. Processing Research

Session 4. Bioenergy & Bioproducts: Forum on Recent Government Initiatives

Session 5. Industrial Chemicals

Session 6. Enzymatic Processes and Enzyme Production

You and those traveling with you will also enjoy the social activities we've included this year, taking advantage of the Symposium's setting in Tennessee's Great Smoky Mountains National Park.

After looking over the schedule and agenda, we hope you'll register to join us this year for the 22nd Symposium. Please use the registration form in this program, or visit our web site to register soon. We look forward to seeing you!

www.ct.ornl.gov/symposium

Conference Program		Social Activities	
Sunday, May 7, 2000			
11:00 am - 3:00 pm, 5:00 pm - 8:00 pm 1:00 pm - 5:00 pm	Registration - Tennessee Ballroom Foyer Session 1: Feedstocks Production, Modification, and Characterization	7:00 pm - 10:00 pm	Welcoming Reception Tennessee Ballroom Foyer
Monday, May 8, 2000			
7:30 am - 8:15 am 8:15 am - 8:20 am 8:20 am - 12:00 noon 12:00 noon - 1:00 pm 1:00 pm - 5:00 pm	Registration Continental Breakfast Speaker's Breakfast Opening Remarks Session 2: Applied Biological Research Lunch Session 3: Processing Research	9:00 am - 12:00 noon 6:00 pm - 7:00 pm 7:00 pm - 10:00 pm	Guest Program (continental breakfast) Social Hour Banquet with Speaker
Tuesday, May 9, 2000			
7:30 am - 8:15 am 8:15 am - 8:20 am 8:20 am - 12:00 noon 12:00 noon - 1:30 pm 1:30 pm - 5:00 pm 7:00 pm - 9:00 pm	Registration Continental Breakfast Speaker's Breakfast Opening Remarks Session 5: Industrial Chemicals Lunch Special Topics (roundtable discussion groups) Session 4: Bioenergy and Bioproducts	9:00 am - 12:00 noon	Guest Program (continental breakfast)
Wednesday, May 10, 2000			
7:30 am - 8:15 am 8:15 am - 8:20 am 8:20 am - 12:00 noon 5:00 pm - 10:00 pm	Registration Continental Breakfast Speaker's Breakfast Opening Remarks Session 6: Enzyme Processes and Enzyme Production Closing Remarks Poster Session	9:00 am - 12:00 noon 12:00 noon - 5:00 pm 6:00 pm - 9:00 pm	Guest Program (continental breakfast) Free Afternoon Reception during Poster Session (buffet and heavy hors d'oeuvres)

Sunday, May 7, 2000

1:00 p.m. - 1:10 p.m. Opening Remarks

Session 1 — Feedstocks Production, Modification, and Characterization

Cochairs: **Jim McLaren, Inverizon International Inc.**
Vincent Chiang, Michigan Technological University

1:10 p.m. Introduction to Session and Overview

1:15 p.m. Oral Presentation 1-01. **Twenty Years of Trials, Tribulations, and Research Progress on Bioethanol Technology: Selected Key Events Along the Way**, *C. Wyman*, Thayer School of Engineering, Dartmouth College, Hanover, New Hampshire

1:40 p.m. Oral Presentation 1-02. **Genetic Modification of Woody Feedstock Qualities**, *R. J. Dinus*, Department of Wood Science, University of British Columbia, Vancouver, British Columbia, Canada

2:10 p.m. Oral Presentation 1-03. **Quality Characteristics of Grasses and Genetic Improvement for Biomass**, *H. G. Jung* and *K. P. Vogel*, U.S. Department of Agriculture, Agricultural Research Service, St. Paul, Minnesota

2:40 p.m. Intermission

2:55 p.m. Oral Presentation 1-04. **Detoxification of Lignocellulose Hydrolysates with Ion-Exchange Resins**, *N.-O. Nilvebrant*, *A. Reimann*, *A. Q. Sáinz*, *S. Larsson*, and *L. J. Jönsson*, Swedish Pulp and Paper Research Institute, Stockholm, Sweden; and Department of Applied Microbiology, Lund Institute of Technology, Lund University, Lund, Sweden

3:20 p.m. Oral Presentation 1-05. **Rapeseed Cake as a Biomass Source for Production of Liquid Fuel**, *E. Çulcuğlu*, *E. Ünay*, and *F. Karaosmanlı*, Department of Chemical Engineering, Istanbul Technical University, Istanbul, Turkey; and Mobil Oil-Turkey, Istanbul, Turkey

3:45 p.m. Oral Presentation 1-06. **Micropropagation and Essential Oils of Four Cultivated Medicinal Plant Species of the Lamiaceae Family**, *P. C. Santos-Gomes*, *M. J. Vilaça-Silva*, *L. Amorim*, *A. P. S. P. Guedes*, *C. Araújo*, *G. Ramos*, *A. Vicente*, and *M. Fernandes-Ferreira*, Department of Biology, University of Minho, Portugal; Biorope, Guilhabreu, Vila do Conde, Portugal; and ERCA/DRAEDM, S Pedro de Merelim, Braga, Portugal

4:10 p.m. Invited Industrial Speaker

4:35 p.m. Session Wrap-up

Monday, May 8, 2000

Session 2 — Applied Biological Research

Cochairs: **Peter Rogers, University of New South Wales**
Barbara R. Evans, Oak Ridge National Laboratory

8:30 a.m. Introduction to Session and Overview

8:35 a.m. Oral Presentation 2-01. **Cloning and Overexpression of Genes Encoding Various Glucose Transporters in Genetically Engineered Glucose- and Xylose-Cofermenting *Saccharomyces* Yeasts**, *N. Ho*, *M. Sedlak*, *Z. Chen*, *S. Ting*, and *A. Brainard*, Laboratory of Renewable Resources Engineering, Purdue University, West Lafayette, Indiana; and Department of Microbiology and Immunology, University of British Columbia, Vancouver, BC, Canada

8:55 a.m. Oral Presentation 2-02. **What Happens to *Pichia stipitis* When It Loses Its Alternative Respiratory Pathway?** *N.-Q. Shi*, *T. W. Jeffries*, and *J. Cruz*, Institute for Microbial and Biochemical Technology,

Forest Products Laboratory, USDA Forest Service, Madison, Wisconsin; Department of Bacteriology, University of Wisconsin, Madison, Wisconsin; and Department of Chemical Engineering, University of Vigo, Ourense, Spain

9:15 a.m. Oral Presentation 2-03. **Genetic Improvement of *Zymomonas mobilis* for Ethanol Production: Chromosomal Integration of the Xylose and Arabinose-Fermenting Genes**, *M. Zhang*, *Y. C. Chou*, *A. Mohagheghi*, *K. Evans*, *S. Milstrey*, *X. K. Lai*, and *M. Finkelstein*, Biotechnology Center for Fuels and Chemicals, National Renewable Energy Laboratory, Golden, Colorado

9:35 a.m. Oral Presentation 2-04. **Evaluation of Recombinant *Zymomonas mobilis* Strains on Corn Fiber Hydrolysate**, *E. Dennison* and *C. Abbas*, Fermentation Research, Archer Daniels Midland, Decatur, Illinois

9:55 a.m. Questions and Session Review

10:05 a.m. Intermission

Monday, May 8, 2000 (continued)

- 10:20 a.m. Part II Introduction and Session Overview
- 10:25 a.m. Oral Presentation 2-05. **Heterologous Expression of *Trichoderma reesei* CBH I: Effect of Site-Directed Mutations on Expression and Thermostability**, S. R. Decker, W. Adney, J. O. Baker, S. McCarter, T. Vinzant, J. Sakon, K. L. Barnett, and M. E. Himmel, Biotechnology Center for Fuels and Chemicals, National Renewable Energy Laboratory, Golden, Colorado; and Chemistry and Biochemistry Department, University of Arkansas, Fayetteville, Arkansas
- 10:45 a.m. Oral Presentation 2-06. **Construction of Antibody-Conjugated Bacterial Magnetic Particles and Application to Biosensors**, R. Sato, H. Takeyama, T. Tanaka, and T. Matsunaga, Department of Biotechnology, Tokyo University of Agriculture and Technology, Koganei, Tokyo, Japan
- 11:05 a.m. Oral Presentation 2-07. **Immobilization of Biocatalysts for Hydrogen Production**, H. O'Neill and J. Woodward, Chemical Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee
- 11:25 a.m. Oral presentation 2-08. **Genetic and Biochemical Diversity of Bacteria in Industrial Wastewater Bioreactors**, M. Bramucci, S. Thomas, C. Qiong, and V. Nagarajan, Central Research and Development Experimental Station, DuPont, Wilmington, Delaware
- 11:45 a.m. Questions and Session Review/Final Discussion
- 12:00 p.m. Session Wrap-up
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- ### Session 3 — Processing Research
- Cochairs:** David N. Thompson, Idaho National Engineering and Environmental Laboratory
Thomas R. Hanley, University of Louisville
- 1:00 p.m. Introduction to Session and Overview
- 1:15 p.m. Oral Presentation 3-01. **Production of Ethanol and Methane from a Sulphite Pulp Mill Process Stream**, T. G. Jantsch, I. Angelidaki, B. de Hvidsten, and B. K. Ahring, Biotechnology, KC, Lund, Sweden; Department of Biotechnology, Technical University of Denmark, Lyngby, Denmark; and Borregaard Industries, Sarpsborg, Norway
- 1:40 p.m. Oral Presentation 3-02. **Use of Carbonic Acid for Hydrolysis of Xylan**, G. P. van Walsum, Environmental Studies and Energy Research Center, Baylor University, Waco, Texas
- 2:10 p.m. Oral Presentation 3-03. **Reactivity Screening, Operation of a Novel Solids-Fed Bioreactor, and Analysis of Mineral Recovery for Conversion of Paper Sludge to Ethanol**, L. Lynd, K. Lyford, J. Munsie, C. South, K. Levenson, and B. Appelqvist, Thayer School of Engineering, Dartmouth College, Hanover, New Hampshire
- 2:40 p.m. Oral Presentation 3-04. **Cellulase Recovery via Membrane Filtration**, W. Mores and R. Davis, Department of Chemical Engineering, University of Colorado, Boulder, Colorado
- 3:10 p.m. Intermission
- 3:30 p.m. Oral Presentation 3-05. **Production of Biosurfactants by a New and Promising Strain of *Pseudomonas* sp. PA1**, L. M. Santa Anna, G. V. Sebastian, E. P. Menezes, T. L. M. Alves, and D. M. G. Freire, Petrobras Research Center and Pharmacy Department, Federal University of Rio de Janeiro, University City, Rio de Janeiro, Brazil; Andre Tosello Foundation, Campinas, São Paulo, Brazil; COPPE/PEQ, Federal University of Rio de Janeiro, Brazil; and Pharmacy Department, Federal University of Rio de Janeiro, Brazil
- 3:55 p.m. Oral Presentation 3-06. **Measurement of Bubble Size Distribution in a Protein Foam Fractionation Column Using a Capillary Probe with Photoelectric Sensors**, L. Du, Y. Ding, A. Prokop, and R. D. Tanner, Chemical Engineering Department, Vanderbilt University, Nashville, Tennessee
- 4:35 p.m. Oral Presentation 3-07. **Mixed Acid Fermentation of Paper Fines and Industrial Biosludge**, S. Domke and M. Holtzapple, Dow Chemical, Freeport, Texas; and Department of Chemical Engineering, Texas A&M University, College Station, Texas
- 5:00 p.m. Session Wrap-up
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- 6:00 p.m. Social Gathering (Tennessee Ballroom Foyer)
- 7:00 p.m. Banquet (Tennessee Ballroom)
- 8:00 p.m. After dinner address by *Dr. Frank Harris*, Board of Directors - Discover Life In America and Associate Laboratory Director of Biological and Environmental Sciences, Oak Ridge National Laboratory, **"All Taxa Survey of the Great Smokies National Park: What it is and Why"**
- Presentation of the Charles D. Scott Award to Dr. Karel Grohmann

Tuesday, May 9, 2000

Session 5 — Industrial Chemicals

Cochairs: Michael Cockrem, KiwiChem International, Inc.
Manoj Kumar, Genencor International, Inc.

- 8:20 a.m. Introduction to Session and Overview
- 8:30 a.m. Oral Presentation 5-01. **Lactic Acid Production Using Engineered Yeasts**, *J. C. Lievens*, D. Porro, L. Brambilla, B. M. Ranzi, L. Alberghina, M. M. Bianchi, L. Frontali, A. A. Winkler, J. P. van Dijken, J. T. Pronk, and C.-L. Liu, A. E. Staley Manufacturing Company, Decatur, Illinois; University of Milan--Bicocca, Milan, Italy; University of Rome La Sapienza, Rome, Italy; BIRD Engineering, Rotterdam, The Netherlands; and Delft University of Technology, Delft, The Netherlands
- 8:55 a.m. Oral Presentation 5-02. **Conversion of Sodium Lactate to Lactic Acid with Water Splitting Electrodialysis**, *A. Torång*, A.-S. Jönsson, and G. Zacchi, Department of Chemical Engineering, Lund University, Lund, Sweden
- 9:20 a.m. Oral Presentation 5-03. **Application of Solid/Gas Biocatalysis: Esterification Reactions**, *S. Lamare* and M. D. Legoy, Laboratoire de Génie Protéique et Cellulaire, Université de La Rochelle, Pôle Sciences et Technologie, La Rochelle, France
- 9:50 a.m. Intermission
- 10:20 a.m. Oral Presentation 5-04. **Enzyme Technology for the Production of a Vitamin C Intermediate**, *T. Dodge*, M. Boston, L. Maheras, M. Kumar, F. Valle, R. LaDuca, and A. Jarnagin, Fermentation Development Department, Genencor International, Palo Alto, California
- 10:45 a.m. Oral Presentation 5-05. **Production of Bacterial Cellulose from Alternate Feedstocks**, *D. Thompson* and M. Hamilton, Biotechnologies Department, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho
- 11:10 a.m. Oral Presentation 5-06. **Production of Levulinic Acid and Use as a Platform Chemical for Derived Products**, *J. J. Bozell*, L. Moens, D. C. Elliott, Y. Wang, G. G. Neuenschwander, W. Fitzpatrick, R. J. Bilski, and J. L. Jarnefeld, National Renewable Energy Laboratory, Golden, Colorado; Pacific Northwest National Laboratory, Richland, Washington; Biofine, Inc., Waltham, Massachusetts; Chemical Industry Services, Inc., Richmond, Virginia; and New York State Energy Research and Development Authority, Albany, New York

11:30 a.m. Oral Presentation 5-07. **Effect of Pretreatments on Surfactin Production from Potato Process Effluent by *Bacillus subtilis***, *D. Thompson*, S. Fox, and G. Bala, Biotechnologies Department, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho

12:00 p.m. Session Wrap-up

Special Topic Discussion Groups

2:00 p.m. - 4:00 p.m.

Special Topic on CO₂ Sequestration. The topics of discussions will include, but are not limited to, the current status of CO₂ sequestration research, the assessment of CO₂ emissions and global warming, and the potential of science and technology (especially biotechnology) in helping to solve this increasingly urgent problem. We will have several short (15-min), interesting presentations followed by discussions. **Chair: James W. Lee, Oak Ridge National Laboratory**

1:30 p.m. - 5:00 p.m.

Special Topic on Commercialization of Biomass to Ethanol. The goal of this workshop is to show participants that we are close to demonstrating the technical viability of an integrated biomass-to-ethanol process and that progressive technical advances and policy decisions will likely greatly enhance the economic attractiveness of the process. The speakers are listed on the write-up page with the title of their presentation. Each speaker will talk for about 15 minutes, and then there will be a 5- to 10-minute question period. **Chairs: Jack N. Saddler and David J. Gregg, University of British Columbia**

Session 4 — Bioenergy and Bioproducts: Forum on Recent Government Initiatives

Cochairs: Robert A. Harris, U.S. Department of Energy
Bruce E. Dale, Michigan State University

7:00 p.m. - 9:00 p.m.

7:00 p.m. Introduction and Session Overview

A roundtable forum on the President's Executive Order, the Bioenergy Initiative, the *Technology Roadmap for Renewables Vision 2020*, and other initiatives. The forum will consist of remarks by the panelists followed by a roundtable discussion with audience participation on the recent Bioenergy Initiative, the Executive Order, and other recent thrusts.

Panelists (invited)

- **Richard Moorer**, DOE's Director of the National Biobased Products and Bioenergy Coordination Office
- **Ron Buckhalt**, USDA's Director of the National Biobased Products and Bioenergy Coordination Office
- **Don Johnson**, Grain Processing Corporation
- **Paul Caswell**, New Uses Council and Archer Daniels Midland
- **Robert Bloksberg-Fireovid**, National Institute of Standards and Technology

9:00 p.m. Session Wrap-up

Wednesday, May 10, 2000

Session 6 — Enzymatic Processes and Enzyme Production

Cochairs: Jeff Tolan, Iogen Corporation
David Short, DuPont, Inc.

8:20 a.m. Introduction and Session Overview

8:35 a.m. Oral Presentation 6-01. **Expression of Thermostable Nitrile Hydratase in *Escherichia coli* for Acrylamide Production**, P. Oriol, R. Padmakumar, and S-H. Kim, Department of Microbiology, Michigan State University, East Lansing, Michigan

9:00 a.m. Oral Presentation 6-02. **Control of the Growth Rate in Cellulase Hyperproducers Derived from *Trichoderma reesei* by Haploidization and Autopolyploidization Techniques**, H. Toyama and N. Toyama, Department of Food Science and Technology, Minamikyushu University, Miyazaki, Japan

9:25 a.m. Oral Presentation 6-03. **Preparation and Characterization of Metallized Cellulose-Binding Domains**, B. R. Evans and J. Woodward, Chemical Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee

9:50 a.m. Intermission

10:10 a.m. Oral Presentation 6-04. **Interaction of *Trichoderma reesei* Cellulases and Lignocellulosic Materials**, H. Palonen, F. Tjerneld, M. Linder, G. Zacchi, and M. Tenkanen, VTT Biotechnology, VTT, Finland

10:35 a.m. Oral Presentation 6-05. **Cellulase Enzyme Production on Bagasse Pretreated with Hot Water**, C. Wyman and M. Bigelow, BC International Corporation, Dedham, Massachusetts; and Thayer School of Engineering, Dartmouth College, Hanover, New Hampshire

11:00 a.m. Oral Presentation 6-06. **Two-Step Steam Pretreatment of Softwood Impregnated with Dilute H₂SO₄ or SO₂ for Ethanol Production**, J. Söderström, L. Pilcher, M. Galbe, and G. Zacchi, Department of Chemical Engineering 1, Lund University, Lund, Sweden

11:25 a.m. Oral Presentation 6-07. **Progress Report: Iogen's Demonstration Plant for Conversion of Cellulosic Biomass to Ethanol by Enzymatic Hydrolysis**, B. Foody and J. S. Tolan, Iogen Corporation, Ottawa, Ontario, Canada

12:00 p.m. Session Wrap-up - Closing Remarks

12:00 p.m. - 5:00 p.m. **Free Afternoon**

Poster Session

Posters should be put up on Tuesday, May 9, 2000.

5:00 p.m. - 7:30 p.m. Sessions 1, 3, 5

7:30 p.m. - 10:00 p.m. Sessions 2, 4, 6

6:00 p.m. - 9:00 p.m. Social Gathering with Buffet

Chair: Nhuan P. Nghiem, Oak Ridge National Laboratory

A tentative list of poster titles is given at the end of this program. An updated list of titles and abstracts is posted on the symposium website.

Chair: Nhuan P. Nghiem
Oak Ridge National Laboratory

All posters should be put up on Tuesday, May 9, 2000. Presenters should be near their respective posters as below:

5:00 p.m. - 7:30 p.m. Sessions 1, 3, 5

7:30 p.m. - 10:00 p.m. Sessions 2, 4, 6

6:00 p.m. - 9:00 p.m. Social Gathering with Buffet

This evening's program will showcase the full range of topics for the areas of the formal sessions. Presenters are encouraged to set up their posters by 1:00 p.m. on Tuesday, May 9. The poster format is most appropriate for presentations that benefit from detailed descriptions and direct interaction between the author and other participants.

Feedstocks Production, Modification, and Characterization

Poster 1-08. **Ethanol from Trash: It's in the Pipeline**, *C. Clements* and K. Martin, Clements Environmental Corporation, Los Angeles, California; and Solid Waste Management Dept., Public Works Agency, County of Ventura, Ventura, California

Poster 1-09. **FTIR Quantitative Analysis of Sugars and Lignin in Pretreated Softwood Solid Residues**, *M. P. Tucker*, Q. A. Nguyen, W. A. McHale, F. P. Eddy, K. Kadam, L. M. Gedvilas, and J. D. Webb, Center for Biotechnology of Fuels and Chemicals, and Center for Measurements and Characterization, National Renewable Energy Laboratory, Golden, Colorado

Poster 1-10. **FTIR Spectroscopy of Xylanase-Oxygen-Peroxide Hardwood Kraft Pulp: A Multivariate Characterization**, *A. R. Gonçalves*, R. Angelo, and N. Duran, Departamento de Biotecnologia, Faculdade de Engenharia Química de Lorena, Lorena, SP, Brazil; and Instituto de Química, Universidade Estadual de Campinas (UNICAMP), Campinas, SP, Brazil

Poster 1-11. **Study of Bleachability and Characterization by FTIR-PCA of Acetosolv Pulps Obtained from Sugarcane Bagasse**, *D. S. Ruzene* and A. R. Gonçalves, Departamento de Biotecnologia, Faculdade de Engenharia Química de Lorena, Lorena, SP, Brazil

Poster 1-12. **Chelation Power of Oxidized Lignins Used in the Peroxide Bleaching of Pulps**, *M. R. Silva*, J. L. Colodette, and A. R. Gonçalves, Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil; and Departamento de Biotecnologia, Faculdade de Engenharia Química de Lorena, Lorena, SP, Brazil

Poster 1-13. **Production of Oxychemicals from Acid-Soluble Hardwood Lignin**, *Q. Xiang* and Y. Y. Lee, Department of Chemical Engineering, Auburn University, Auburn, Alabama

Poster 1-14. **Effect of Pretreatment Reagent and Hydrogen Peroxide on the Enzymatic Hydrolysis of Oakwood in the Percolation Process**, *S. B. Kim*, B. H. Um, and S. C. Park, Department of Chemical Engineering, Gyeongsang National University, Chinju, South Korea; and Korea Institute of Energy Research, Biomass Research Team, Taejeon, Korea

Poster 1-15. **Predicting Enzymatic and Rumenal Digestibility of Pretreated Biomass**, *L. Rao* and Bruce Dale, Department of Chemical Engineering, Michigan State University, East Lansing, Michigan

Poster 1-16. **Improvement of Photosynthetic Efficiency Through Reduction of Chlorophyll Antenna Size**, *J. W. Lee*, L. Mets, and E. Greenbaum, Chemical Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee; and Department of Molecular Genetics and Cell Biology, University of Chicago, Chicago, Illinois

Poster 1-17. **Photosynthetic Hydrogen Production in Two *Chlamydomonas* Mutants—Enhanced Oxygen Tolerance**, *J. W. Lee*, M. Ghiradi, M. Seibert, and E. Greenbaum, Oak Ridge National Laboratory, Oak Ridge, Tennessee; and National Renewable Energy Laboratory, Golden, Colorado

Poster 1-18. **Substrate Specificity of α -Galactosidases from Different Fungal Sources**, *N. Nutsudizze*, M. Moore, K. Krumm, and F. Brinkhaus, Kemin Industries, Inc./Kemin Biotechnology, LC, Des Moines, Iowa; and Iowa State University, Ames, Iowa

Poster 1-19. **Determination of Reaction Kinetics of Straw and Stalk of Rapeseed Using Thermogravimetric Analysis**, *F. Karaosmanoğlu*, B. D. Çift, and A. Işığür-Ergüdenler, Chemical Engineering Department, Istanbul Technical University, Istanbul, Turkey

Applied Biological Research

Poster 2-09. **Preliminary Considerations Regarding the Use of Immobilized *Candida guilliermondii* Cells in Xylitol Production from Sugarcane Bagasse Hydrolysate**, *S. Silva*, W. Carvalho, M. Vitolo, M. Felipe, and I. Mancilha, Departamento de Engenharia Química, Faculdade de Engenharia Química de Lorena, Lorena, SP, Brazil; and Departamento de Tecnologia Bioquímica-Farmacêutica, Universidade de São Paulo, São Paulo, SP, Brazil

Poster 2-10. **Characterization and Development of Thermophilic Cellulolytic Bacteria for Biomass Conversion Processes**, *M. Ozkan*, S. G. Desai, Y. Zhang, D. M. Stevenson, J. Beane, and L. H. Lynd, Thayer School of Engineering, Dartmouth College, Hanover, New Hampshire

Poster 2-11. **Metabolic Engineering of *Saccharomyces cerevisiae* for the Production of Ethanol from Xylose**, *Y-S. Jin* and T. W. Jeffries, Department of Food Science, University of Wisconsin-Madison, Madison, Wisconsin; and Institute for Microbial and Biochemical Technology, Forest Products Laboratory, USDA Forest Service, Madison, Wisconsin

Poster 2-12. **Continuous Ethanol Production by Immobilized *Escherichia coli* KO11 in a Fluidized-Bed Bioreactor**, *N. B. Pamment*, B. Zhou, G. J. Dumsday, and G. A. Stanley, Department of Chemical Engineering, University of Melbourne, Parkville, Victoria, Australia

Poster 2-13. **Preparation of an Amylolytic and Ethanol-Producing Yeast Strain by Recombinant DNA Technology**, *J. X. Luo*, R. L. Ye, and T. Y. Zhang, School of Life Sciences, Zhongshan University, Guangzhou, China

Poster 2-14. **Cloning and Overexpression of TAL1, TKL1, and ADH1 in Glucose- and Xylose-Cofermenting *Saccharomyces* Yeasts and Their Effect on Ethanol Fermentation**, N. Ho, Z. Chen, M. Sedlak, and A. Brainard, Laboratory of Renewable Resources Engineering, Purdue University, West Lafayette, Indiana

Poster 2-15. **Development of 2-Deoxyglucose Mutants of Genetically Engineered Glucose- and Xylose-Cofermenting *Saccharomyces* Yeasts for Improved Ethanol Production**, Y. Bai and N. Ho, Laboratory of Renewable Resources Engineering, Purdue University, West Lafayette, Indiana (poster withdrawn)

Poster 2-16. **Fermentation Performance Assessment of a Chromosomally Integrated Xylose-Utilizing Recombinant of *Zymomonas mobilis* 39676**, H. Lawford, and J. Rousseau, Bio-Engineering Laboratory, Department of Biochemistry, University of Toronto, Toronto, Ontario, Canada

Poster 2-17. **Comparative Ethanol Productivities of Different *Zymomonas* Recombinants Fermenting Oat Hull Hydrolysate**, J. S. Tolan, H. G. Lawford and J. D. Rousseau, Iogen Corporation, Ottawa, Ontario, Canada; and Bio-Engineering Laboratory, Department of Biochemistry, University of Toronto, Toronto, Ontario, Canada

Poster 2-18. **The Roles of Glycolytic Flux and *D-lhd* in Lactic Acid Production by *Zymomonas mobilis* in Batch and Continuous Fermentations**, H. G. Lawford and J. D. Rousseau, Bio-Engineering Laboratory, Department of Biochemistry, University of Toronto, Toronto, Ontario, Canada (poster withdrawn)

Poster 2-19. **Lactic Acid Fermentation from Enzyme-Thinned Starch with Immobilized *Lactobacillus amylovorus***, R. Bajpai, J. Yan, and E. Iannotti, Chemical Engineering Department and Biological and Agriculture Engineering Department, University of Missouri–Columbia, Columbia, Missouri

Poster 2-20. **Bacteriocin Production by *Zymomonas mobilis***, P. L. Rogers and C. C. K. Tan, Department of Biotechnology, University of New South Wales, Sydney, Australia

Poster 2-21. **Sequence Data Analysis of Mutants of *Zymomonas mobilis* with Altered Substrate Preference for Xylose and Glucose**, P. L. Rogers, S. G. Supple, E. L. Joachimsthal, and N. W. Dunn, Department of Biotechnology, University of New South Wales, Sydney, Australia

Poster 2-22. **Characterization of Bile Salt Hydrolase Activity from *Lactobacillus plantarum* G100**, T. Elmejdoub, D. Roblain, J. Destain, and P. Thonart, Centre Wallon de Biologie Industriel, Unité de Bio-Industrie, Faculté Universitaire des Sciences Agronomiques, Gembloux, Belgium

Poster 2-23. **Analysis of the Genes Required for Bacterial Magnetic Particles Synthesis in Magnetic Bacterium *Magnetospirillum* sp. AMB-1**, A. T. Wahyudi, H. Takeyama, T. Sakaguchi, S. Kawahara, and T. Matsunaga, Department of Biotechnology, Tokyo University of Agriculture and Technology, Koganei, Tokyo, Japan

Poster 2-24. **Mass Production of a Functional Bionanomagnet by a Recombinant Magnetic Bacterium, *Magnetospirillum* sp. AMB-1**, C. Yang, H. Takeyama, T. Tanaka, T. Sakaguchi, and T. Matsunaga, Department of Biotechnology, Tokyo University of Agriculture and Technology, Koganei, Tokyo, Japan

Poster 2-25. **Evaluation of *Panus tigrinus* Strains in the Delignification of Sugarcane Bagasse Prior to Kraft Pulping**, S. M. Costa, A. R. Gonçalves, and E. Esposito, Departamento de Biotecnologia, Faculdade de Engenharia Química de Lorena, Lorena, SP, Brazil; and Departamento de Bioquímica, Universidade Federal de Santa Catarina, Florianópolis, SC, Brazil

Poster 2-26. **Overexpression of Glucose-6-Phosphate Dehydrogenase (G6PD) in Genetically Modified *Saccharomyces cerevisiae***, A. Pessoa, Jr., F. H. Lojudice, D. P. Silva, M. Vitolo, N. I. T. Zanchin, and C. C. Oliveira, Department of Biochemical and Pharmaceutical Technology, Faculty of Pharmacy and Department of Biochemistry, Chemistry Institute, University of São Paulo, São Paulo, SP, Brazil

Poster 2-27. **Measurement of Electrostatic Potentials Generated from Single PSI Reaction Centers in a Heterostructure**, I. Lee, J. Lee, A. Stubna, and E. Greenbaum, Chemical Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee; and University of Tennessee, Knoxville, Tennessee

Poster 2-28. **Characterization of Physiological Behavior of Free and Immobilized *Bacillus subtilis*: Effect of Acetate on the Dehydrogenase Activity of the Isocitrate**, E. Duran-Paramo, O. Garcia-Kirchner, J.-F. Hervagault, D. Thomas, and J.-N. Barbotin, Laboratoire de Technologie Enzymatique, Université de Technologie de Compiègne, Compiègne, France; Departamento de Bioprocessos, UPIBI, Instituto Politécnico Nacional, Ticomán, México; and Laboratoire du Génie Cellulaire, Université de Picardie Jules Verne, Amiens, France

Poster 2-29. **Site-Directed Mutagenesis of the EI Endoglucanase from *Acidothermus cellulolyticus***, S. L. McCarter, W. S. Adney, J. O. Baker, T. B. Vinzant, R. D. Guckian, S. R. Decker, J. Sakon, and M. E. Himmel, Biotechnology Center for Fuels and Chemicals, National Renewable Energy Laboratory, Golden, Colorado; and Chemistry and Biochemistry Department, University of Arkansas, Fayetteville, Arkansas

Poster 2-30. **A Simple Method for Measuring Hydrogenotroph Activity in Anaerobic Reactors**, S. E. Hassouna and D. Stuckey, Department of Environmental Studies, Alexandria University, Alexandria, Egypt; and Imperial College of Science, Technology, and Medicine, University of London, London, United Kingdom (poster withdrawn)

Poster 2-31. **Development of a Two-Stage System for Sustained Algal Hydrogen Production**, M. Ghirardi, M. Forestier, J. Lee, L. Zhang, E. Greenbaum, A. Melis, and M. Seibert, Basic Sciences Center, National Renewable Energy Laboratory, Golden, Colorado; Chemical Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee; and Department of Plant and Microbial Biology, University of California, Berkeley, California

Poster 2-32. **Hydrogen Production Using Hyperthermophilic Sources of Glucose Dehydrogenase and Hydrogenase**, N. Heyer, H. O'Neill, M. Danson, and J. Woodward, Chemical Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee; and School of Biology and Department of Biochemistry, University of Bath, Bath, United Kingdom

Poster 2-33. **Accumulation of Polyhydroxyalkanoate Blends by a Strain YS1 Isolated from Activated Sludge**, K. Hong, G. Chen, H. Yu, Q. Wu, and G. Zhang, Division of Research Affairs, South China University of Tropical Agriculture, Danzhou, Hainan, China; Department of Biological and Biotechnology, Tsinghua University, Beijing, China; and Department of Applied Biology and Chemical Technology, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China

Poster 2-34. **An Optimal Magnetite-Immobilized *Pseudomonas Putida* 5-x Cell Process for Cu²⁺ Removal from Industrial Waste Effluent**, H. Chua, L. Wang, P. K. Wong, W. H. Lo, and S. N. Sin, Department of Civil and Structural Engineering and Department of Applied Biological and Chemical Technology, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China; and Department of Biology, Chinese University of Hong Kong, Shatin, Hong Kong, China

Poster 2-35. **Efficient 3,5-Dichlorobenzene Biodegradation by a Mutant of *Bacillus* Derived from Industrial Gas Effluent**, H. Chua, L. Wang, and D. Ren, Department of Civil and Structural Engineering, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China; and Institute of Genetics, Fudan University, Shanghai, China

Poster 2-36. **High-Specificity Biomolecular Ligands for Sequestration of Radioactive Elements in Oil-Drilling Wastes**, L. E. O'Connor, J. W. Barton, R. D. Kirkegaard, and B. H. Davison, Chemical Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Poster 2-37. **Biosorption of Heavy Metals (Cr, Cu, Ni, Pb, Zn) by Bacteria Isolated from Activated Sludge**, W.-C. Leung, H. Chua, and W. Lo, Department of Applied Biology and Chemical Technology and Department of Civil and Structural Engineering, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China

Poster 2-38. **Utilization of Cyanobacteria in Photobioreactors for Water Cleanup**, S. A. Markov, K. A. Darville, A. M. Gaffney, C. Hall, N. Mark, M. A. Ojemuyiwa, and M. Gunasekaran, Department of Biology, Fisk University, Nashville, Tennessee

Poster 2-39. **Enhancement of the Conversion of Toluene by *Pseudomonas putida* F-1 Using Organic Cosolvents**, M. Rodriguez, Jr., K. T. Klasson, and B. H. Davison, Bioprocessing Research and Development Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Poster 2-40. **Effect of Temperature on the Biofiltration of Nitric Oxide**, K. T. Klasson and B. H. Davison, Bioprocessing Research and Development Center, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Poster 2-41. **Isolation and Characterization of a Formaldehyde-Resistant Marine Bacterium and Its Potential Application in Bioremediation**, T. Yamazaki, W. Tsugawa, and K. Sode, Department of Biotechnology, Tokyo University of Agriculture and Technology, Koganei, Tokyo, Japan

Poster 2-42. **BIO-SEP: An Advanced Biocatalyst Support System for Groundwater and Wastewater Treatment**, K. L. Sublette, S. Harmon, and C. Camp, Center of Environmental Research and Technology, University of Tulsa, Tulsa, Oklahoma; and DuPont, Wilmington, Delaware

Poster 2-43. **Mechanism and Kinetics of Lignin Peroxidase N-Demethylation Reactions**, V. S. Ferreira, A. A. Leitão, and E. P. S. Bon, Laboratório de Tecnologia Enzimática, Instituto de Química-Universidade Federal do Rio de Janeiro, Centro de Tecnologia, Rio de Janeiro, RJ, Brazil

Poster 2-44. **The Activation Role of *NILI* on L-Asparaginase II Production in *Saccharomyces cerevisiae***, E. P. S. Bon, E. M. M. Oliveira, R. M. Almeida, and E. Carvajal, Laboratório de Tecnologia Enzimática, Instituto de Química, Universidade Federal do Rio de Janeiro, Centro de Tecnologia, Rio de Janeiro, RJ, Brazil; and Departamento de Biologia Celular e Genética, Instituto de Biologia, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil

Poster 2-45. **Production of the Periplasmic L-Asparaginase II of *Saccharomyces cerevisiae*: The Effect of Osmotic Shock on the Extraction**, E. P. S. Bon, A. S. Martins, E. M. M. Oliveira, and E. Carvajal, Laboratório de Tecnologia Enzimática, Instituto de Química-Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil; and Departamento de Biologia Celular E Genética, Instituto de Biologia, Universidade Estadual do Rio Janeiro, Rio de Janeiro, Brazil

Poster 2-46. **Dissemination of Catabolic Plasmids Among Desiccation-Tolerant Bacteria in Soil Microcosms**, F. Weekers, C. Rodriguez, P. Jacques, D. Springael, M. Mergeay, and Ph. Thonart, Walloon Center for Industrial Biology, University of Liege, Liege, Belgium; Agricultural University of Gembloux, Gembloux, Belgium; and Flemish Institute for Technological Research, Mol, Belgium

Poster 2-47. **Cofermmentation of Glucose and Xylose by Integrated Strains of *Zymomonas mobilis***, K. Evans, A. Mohagheghi, Y.-C. Chou, and Min Zhang, Biotechnology Center for Fuels and Chemicals, National Renewable Energy Laboratory, Golden, Colorado

Poster 2-48. **Evaluation of *Lactobacillus* Mont4 for Cell Growth and Glucose Conversion in the Presence of Overlimed Hardwood Hydrolysate and Ethanol**, M. Zhang, A. Mohagheghi, and F. A. Keller, Biotechnology Center for Fuels and Chemicals, National Renewable Energy Laboratory, Golden, Colorado

Processing Research

Poster 3-08. **Continuous Production of Ethanol and Fructose in a Bioreactor Coupled to Membrane Processes**, T. L. M. Alves, M. Di Luccio, and C. P. Borges, Programa de Engenharia Química, COPPE/ Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil

Poster 3-09. **Ethanol Production by Simultaneous Saccharification and Fermentation of Olive Oil Extraction**, I. Ballesteros, M. Ballesteros, J. M. Oliva, and F. Saez, Department of Renewable Energies, CIEMAT, Madrid, Spain

Poster 3-10. **Ammoniation Pressurization and Depressurization of Sugar Beet Pulp for Production of Fuel Ethanol**, J. Doran and B. Foster, Department of Biology, Central Michigan University, Mt. Pleasant, Michigan

Poster 3-11. **Production of Fuel Ethanol from Softwood**, M. Alkasrawi, M. Galbe, and G. Zacchi, Department of Chemical Engineering, Lund University, Lund, Sweden

Poster 3-12. **Net Energy Analysis of Producing Ethanol and Protein from Alfalfa**, D. Soffin and B. Dale, Department of Chemical Engineering, Michigan State University, East Lansing, Michigan

Poster 3-13. **Multidimensional Regression Mapping of Biomass to Ethanol Process Design and Economics**, R. Wooley and M. Ruth, National Renewable Energy Laboratory, Golden, Colorado

Poster 3-14. **Understanding the Role of Oligomers in Hemicellulose Hydrolysis for Low-Acid and No-Acid Pretreatment**, S. E. Jacobsen and C. E. Wyman, Department of Chemical and Biochemical Engineering, Thayer School of Engineering, Dartmouth College, Hanover, New Hampshire

- Poster 3-15. **Kinetic Aspects of the Dilute-Acid Catalysis and Autohydrolysis of Hardwood Hemicellulose**, *R. W. Torget*, A. D. Haverkamp, and B. R. Hames, Biotechnology Center for Fuels and Chemicals and Chemistry for Bioenergy System, National Renewable Energy Laboratory, Golden, Colorado
- Poster 3-16. **Kinetics of Cellulose Hydrolysis Under Extremely Low-Sulfuric-Acid and High-Temperature Conditions**, *J. S. Kim*, Y. Y. Lee, and R. W. Torget, Department of Chemical Engineering, Auburn University, Auburn, Alabama; and National Renewable Energy Laboratory, Golden, Colorado
- Poster 3-17. **A Comparison of Hot Liquid Water and Steam Pretreatment of Agricultural Residues**, *S. G. Allen*, D. Schulman, J. Lichwa, M. J. Antal, Jr., M. S. Laser, and L. R. Lynd, Hawaii Natural Energy Institute, University of Hawaii at Manoa, Honolulu, Hawaii; and Thayer School of Engineering, Dartmouth College, Hanover, New Hampshire
- Poster 3-18. **High-Yield Fermentation of Softwood Hydrolysate by Adapted Yeast Followed by HPLC and FTIR**, *F. Keller*, M. Tucker, F. Eddy, and Q. Nguyen, National Renewable Energy Laboratory, Golden, Colorado
- Poster 3-19. **Investigation of Hot Separation and Washing Techniques to Produce Highly Digestible Pretreated Solids Following Dilute-Acid Prehydrolysis of Hardwood**, *R. Elander*, R. Torget, K. Ibsen, and M. Ruth, Biotechnology Center for Fuels and Chemicals, National Renewable Energy Laboratory, Golden, Colorado
- Poster 3-20. **Kinetics of Ethanol Fermentation with High Biomass Concentration, Including the Effect of Temperature**, *A. C. Costa*, D. I. P. Atala, R. M. Filho, and F. Maugeri, Departamento de Processos Químicos, Faculdade de Engenharia Química and Departamento de Engenharia de Alimentos, UNICAMP, Campinas, SP, Brazil
- Poster 3-21. **A Hybrid Neural Network Algorithm for On-Line State Inference That Accounts for Differences in the Inoculum of *Cephalosporium acremonium* in Fed-Batch Runs**, *R. C. Giordano*, R. Silva, A. Cruz, C. Hokka, and R. Giordano, Departamento de Engenharia Química, Universidade Federal de São Carlos, São Carlos, SP, Brazil
- Poster 3-22. **Continuous Countercurrent Extraction of Hemicellulose from Pretreated Wood Residues**, *K. H. Kim*, M. P. Tucker, W. McHale, A. Aden, and Q. A. Nguyen, National Renewable Energy Laboratory, Golden, Colorado
- Poster 3-23. **Continuous Ethanol Production with a Membrane Bioreactor: Pilot Trials in a Corn Wet Mill**, *J. Escovar-Kousen*, K. Rane, and M. Cheryan, Agricultural Bioprocess Laboratory, University of Illinois at Urbana-Champaign, Urbana, Illinois
- Poster 3-24. **Ethanol Production from Glucose and Xylose Mixtures by Immobilized Recombinant Yeast *Saccharomyces 424A* (LNH-ST)**, *N. P. Nghiem*, M. S. Krishnan, B. H. Davison, A. N. Jackson, and T. M. Cofer, Chemical Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee
- Poster 3-25. **Ethanol Production from Glucose and Xylose Mixtures by Immobilized Recombinant *Zymomonas mobilis* ATCC 31821(pZB5) in a Fluidized-Bed Reactor**, *N. P. Nghiem*, M. S. Krishnan, B. H. Davison, A. N. Jackson, and T. M. Cofer, Chemical Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee
- Poster 3-26. **Pulsating Pressure Operation and Solid-State Fermentation**, *C. Hongzhang* and L. Zuohu, Laboratory of Biochemical Engineering, Institute of Chemical Metallurgy, Chinese Academy of Sciences, Beijing, China
- Poster 3-27. **Honeycomb-Structure Monoliths for Biotechnology of Fuels and Chemicals**, *A. Zakabunin*, I. Andreeva, A. Simakov, A. Mohagheghi, N. Sazonova, N. Kulikovskaya, E. Ryabchikova, and B. Zaitsev, State Research Center of Virology and Biotechnology “Vector,” Koltsovo, Russia; Boreskov Institute of Catalysis, RAS, Novosibirsk, Russia; and National Renewable Energy Laboratory, Golden, Colorado
- Poster 3-28. **Droplet Fractionation of a Dilute Mixture of Bromelain and Invertase Solution Using Sonic Waves**, *S. Ko*, R. D. Tanner, and A. Prokop, Chemical Engineering Department, Vanderbilt University, Nashville, Tennessee
- Poster 3-29. **Effect of Natural Antifoaming Agents/Contaminants on the Foam Fractionation of Bromelain**, *S. Ko*, J. Cherry, A. Prokop, and R. D. Tanner, Chemical Engineering Department, Vanderbilt University, Nashville, Tennessee
- Poster 3-30. **Evaluation of Three Cellulolytic Fungal Strains for Antibiotic Production Using Sugarcane Bagasse Pith as the Sole Carbon Source**, *O. Garcia-Kirchner*, M. Segura-Granados, J. M. Muñoz-Aguilar, and E. Duran-Paramo, Departamento de Biotecnología, Unidad Profesional Interdisciplinaria de Biotecnología—Instituto Politécnico Nacional, Ticomán, México
- Poster 3-31. **Cassava Starch Maltodextrinization/Monomerization Through Thermopressurized Aqueous Phosphoric Acid Hydrolysis**, *J. D. Fontana*, M. Passos, J. Luiz, F. Trindade, and L. P. Ramos, Biomass Chemo/Biotechnology Laboratory and Department of Biochemistry and Research Center on Applied Chemistry, Federal University of Parana, Curitiba, PR, Brazil
- Poster 3-32. **Novel Process of Fumaric Acid Fermentation Coupled with Ion-Exchange Resin Column and Product Recovery by Zeolites**, *Y. Zhou*, J. Du, and G. T. Tsao, Laboratory of Renewable Resources Engineering, Purdue University, West Lafayette, Indiana
- Poster 3-33. **Comparison of Fumaric Acid Production by *Rhizopus oryzae* Using Different Neutralizing Agents**, *Y. Zhou*, J. Du, and G. T. Tsao, Laboratory of Renewable Resources Engineering, Purdue University, West Lafayette, Indiana
- Poster 3-34. **Kinetic Aspects of Xylitol Formation from Batch Fermentation of Sugarcane Bagasse Acid Hydrolysate**, *S. S. Silva*, L. M. Dutra, and M. G. Felipe, Departamento de Biotecnologia, Faculdade de Engenharia Química de Lorena, Lorena, São Paulo, Brazil
- Poster 3-35. **Fermentation of Xylose into Acetic Acid by *Clostridium thermoaceticum***, *N. Balasubramanian* and Y. Y. Lee, Department of Chemical Engineering, Auburn University, Auburn, Alabama
- Poster 3-36. **Reduction of Organic Compounds, Color, and Turbidity in Wastewater from the Pulp and Paper Industry**, *R. Bergamasco*, A. N. M. Rodrigues, M. L. Gimenes, C. R. G. Tavares, and E. T. Abreu, Departamento de Engenharia Química, Universidade Estadual de Maringá, Maringá, PR, Brazil
- Poster 3-37. **Residue Minimization in the Leather Industry**, *C. R. Tavares* and E. Almeida, Department of Chemical Engineering, State University of Maringa, Maringa, Parana, Brazil; and CS Pesquisas e Participações Industriais Ltda
- Poster 3-38. **Evaluation of a Fungal Bioreactor for Treatment of Effluent from a Kraft Bleach Plant**, *C. R. Tavares* and A. Santos, Department of Chemical Engineering, State University of Maringá, Maringá, Paraná, Brazil

Poster 3-39. **Nitrification and Denitrification Processes for Biological Treatment of Industrial Effluents**, *R. Rocha* and C. R. Tavares, Department of Chemical Engineering, State University of Maringá, Maringá, Paraná, Brazil

Poster 3-40. **Removal and Recovery of Copper(II) Ions by Bacterial Biosorption**, *M-F. Wong*, W. Lo, and H. Chua, Department of Applied Biology and Chemical Technology, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China

Poster 3-41. **Effects of Bacterial Biofilms on the Distribution of Toxic Heavy Metals in a Simulated Environment**, *S-C. Choi*, O. Wai, and W. Lo, Department of Civil and Structural Engineering and Department of Applied Biology and Chemical Technology, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China

Poster 3-42. **Application of Factorial Design to the Study of Heavy Metals Biosorption by Waste Biomass from Brazilian Beverage Distilleries**, *H. F. De Castro*, M. A. Dias, V. R. Linardi, and R. A. Conte, Departamento de Engenharia Química and Departamento de Materiais, Faculdade de Engenharia Química de Lorena, Lorena, São Paulo, Brazil; and Departamento de Microbiologia, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

Poster 3-43. **Hybrid Neural Modeling of an Ethanol Fermentation Process**, *A. C. da Costa*, L. H. P. Harada, R. M. Filho, and E. L. Lima, Departamento de Processos Químicos, Faculdade de Engenharia Química, UNICAMP, Campinas, SP, Brazil; and Departamento de Engenharia Química, COPPE/Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil

Poster 3-44. **Prediction of Supercritical Fluid Extraction Conditions for Cholesterol from Milk Fat**, *A. A. Maul*, C. B. Maul-Coutinho, and J. F. Magalhães, Departamento de Farmácia, Faculdade de Ciências Farmacêuticas, Universidade de São Paulo, São Paulo, SP, Brazil; and Departamento de Farmácia, Centro Universitário FMU, São Paulo, SP, Brazil

Poster 3-45. **Effect of Yeast Extract on *Monascus purpureus* Batch Growth Kinetics**, *B. V. Kilikian* and D. Gerevini, Department of Chemical Engineering, University of São Paulo, São Paulo, SP, Brazil

Poster 3-46. **Effect of Aeration and Hemicellulosic Sugars on Xylitol Production by *Candida tropicalis***, *F. A. Agblevor*, T. Walther, and P. Hensirisak, Biological Systems Engineering Department, Virginia Polytechnic Institute and State University, Blacksburg, Virginia; and Department of Mechanical Engineering, Technical University of Dresden, Dresden, Germany

Poster 3-47. **Evaluation of Mature Biomass Ethanol Technology Using an Aspen Plus Process Model**, *G. P. van Walsum* and L. R. Lynd, Department of Environmental Studies and Glasscock Energy Research Center, Baylor University, Waco, Texas; and Thayer School of Engineering, Dartmouth College, Hanover, New Hampshire

Poster 3-48. **Modeling and Simulation of a Countercurrent Shrink-Bed Reactor for Dilute-Acid Hydrolysis**, *P. Pettersson*, R. Eklund, J. Saltin, and G. Zacchi, Department of Industrial Technology, Mid Sweden University, Örnköldsvik, Sweden; and Chemical Engineering 1, Lund University, Lund, Sweden

Poster 3-49. **Fixed-Bed Pyrolysis of the Rapeseed Cake**, *E. Çulcuoğlu*, S. Şensöz, S. Yorgun, D. Angin, and F. Karaosmanolu, Department of Chemical Engineering, Istanbul Technical University, Istanbul, Turkey; Department of Chemical Engineering, Osmangazi University, Istanbul, Turkey; and Mobil Oil-Turkey, Istanbul, Turkey

Poster 3-50. **Fractionation of Steam-Pretreated Douglas Fir to Enhance Enzymatic Hydrolysis**, *J. N. Saddler*, B. Yang, Y. Lu, C. Johansson, and D. Gregg, Forest Products Biotechnology, Faculty of Forestry, The University of British Columbia, Vancouver, British Columbia, Canada

Poster 3-51. **Decaffeination of Guaraná Seeds (*Paullinia cupana* Kunth, Sapindaceae) by Supercritical Fluid Extraction**, *A. A. Maul*, C. B. Maul-Coutinho, M. L. Brazzach, and J. F. Magalhães, Departamento de Farmácia, Faculdade de Ciências Farmacêuticas, Universidade de São Paulo, São Paulo, SP, Brazil; and Departamento de Farmácia, Centro Universitário FMU, São Paulo, SP, Brazil

Poster 3-52. **Upgrading New Brunswick Benchtop Fermenters to In-House PC-Based Computer Control**, *O. de la Salle* and S. P. Shoemaker, California Institute of Food and Agricultural Research, University of California-Davis, Davis, California

Poster 3-53. **Process Optimization for Xylose Bioconversion to Xylitol by *Candida tropicalis***, *J-H. Kim*, Y-W. Ryu, J-H. Seo, and S. P. Shoemaker, Department of California Institute of Food and Agricultural Research, University of California-Davis, Davis, California; Department of Biotechnology, Ajou University, Korea; and Department of Food Science and Technology, Seoul National University, Korea

Poster 3-54. **Evaluation of the Cellobiose-Fermenting Yeasts in the Simultaneous Saccharification and Fermentation of Dilute Acid-Pretreated Rice Straw**, *E. Y. Vlasenko*, H. Ding, and S. P. Shoemaker, California Institute of Food and Agricultural Research, University of California-Davis, Davis, California

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No submissions

Industrial Chemicals

Poster 5-08. **High-Pressure Hydrolysis of Lignins Obtained from Different Sources**, *A. R. Gonçalves* and U. Schuchardt, Departamento de Biotecnologia, Faculdade de Engenharia Química de Lorena, Lorena, SP, Brazil; and Instituto de Química, Universidade Estadual de Campinas (UNICAMP), Campinas, SP, Brazil

Poster 5-09. **Production of Specific Copolymers of Polyhydroxyalkanoates from Industrial Waste**, *P. H. F. Yu*, A. L. Wong, and H. Chua, Union Laboratory of Asymmetric Synthesis, Department of Applied Biology and Chemical Technology and Department of Civil and Structural Engineering, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China

Poster 5-10. **Thermoinducible Gene Expression System Based on *Bacillus subtilis* Phage ϕ 105 and Its Potential Use for the Production of Polyhydroxyalkanoates**, *P. H. F. Yu*, K. H. Law, and H. Chua, Union Laboratory of Asymmetric Synthesis, Department of Applied Biology and Chemical Technology and Department of Civil and Structural Engineering, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong, China

Poster 5-11. **Nutritional Effects on Lactic Acid Production Without Addition of a Neutralizer in the *Rhizopus oryzae* Fermentation Process**, *J. Gao*, R. S. Skeen, and R. Quesenberry, Bioprocessing Group, Environmental Technology Division, Pacific Northwest National Laboratory, Richland, Washington

Poster 5-12. **Characterization of Immobilized *Enterococcus faecalis* RKY1 for Enhanced Production of Succinate**, R. Hwa-Won and W. Young-Jung, Department of Biochemical Engineering, Chonnam National University, Kwangju, Korea

Poster 5-13. **Effect of Protein Adsorption on the Hydraulic Permeability of Polymeric Membranes**, R. K. Bajpai, J. Johansson, and H. K. Yasuda, Department of Chemical Engineering, University of Missouri–Columbia, Columbia, Missouri

Poster 5-14. **Modeling and Simulation of Cephalosporin C Production in a Fed-Batch Tower-Type Bioreactor**, A. Cruz, R. Almeida, M. L. Araujo, R. Giordano, and C. Hokka, Department of Chemical Engineering, Universidade Federal de São Carlos, São Carlos, SP, Brazil; and Instituto de Química, UNESP, Araraquara, SP, Brazil

Poster 5-15. **Influence of the Culture Conditions on Lipopeptide Production by *Bacillus subtilis***, E. Akpa, P. Jacques, R. Fuchs, H. Budzikiewicz, B. Wathelet, M. Paquot, and P. Thonart, CWBI (Unité de Bio-Industries) and Unité de Chimie Biologique, Faculté Universitaire des Sciences Agronomiques, Gembloux, Belgium; and Institut für Organische Chemie, Köln, Germany

Poster 5-16. **Mathematical Modeling of Controlled-Release Kinetics of Herbicides in a Water Bath Using a Dynamic System**, F. M. Pereira, A. R. Gonçalves, F. T. Silva, A. Ferraz, and S. C. Oliveira, Departamento de Biotecnologia, Faculdade de Engenharia Química de Lorena, Lorena, SP, Brazil

Poster 5-17. **The Influence of Bark-Derived Extractives on Fermentation of Softwood Prehydrolyzates to Ethanol**, J. N. Saddler, J. Robinson, A. Boussaid, and D. J. Gregg, Forest Products Biotechnology, Department of Wood Science, The University of British Columbia, Vancouver, British Columbia, Canada

Enzymatic Processes and Enzyme Production

Poster 6-08. **Effective Thermostable α -Amylase Production from Bacterial Phage f105—Based Recombinant *Bacillus subtilis***, W. Lo, G. Liu, Y-Y. Wang, and Y-C. Leung, Department of Applied Biology and Chemical Technology, Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong

Poster 6-09. **In-House Production of Bacterial α -Amylase and Fungal Glucoamylase by Solid-State Fermentation with *Bacillus* sp. and *Aspergillus* sp. for Hydrolysis of Starchy Biomass**, S. K. Soni and H. Singh, Department of Microbiology, Punjab University, Chandigarh, India

Poster 6-10. **Effect of Phosphorus on Phosphatase Production by Ectomycorrhizal Fungi**, A. de Araujo, J-P. Dimbour, and S. Roussos, IRD, Université de Provence, CESB/ESIL, Marseille, France

Poster 6-11. **Influence of Temperature on the Growth and Xylanolytic Enzyme Production by *Aspergillus fumigatus***, R. M. Peralta, C. G. M. Souza, and C. G. Boer, Departamento de Bioquímica, Universidade Estadual de Maringá, Maringá, PR, Brazil

Poster 6-12. **Lipase and Protease Production by *Penicillium restrictum*: Physiological Behavior in Submerged and Solid-State Fermentations**, D. M. G. Freire, P. Gomes, A. Pinto, and L. Castilho, Faculty of Pharmacy and PEQ/COPPE, Federal University of Rio de Janeiro, Rio de Janeiro, RJ, Brazil; and Biochemical Engineering Division, Gesellschaft für Biotechnologische Forschung, Braunschweig, Germany

Poster 6-13. **Solid-State Fermentation of Phytase from Cassava Dregs**, K. Hong, Y. Ma, M. Li, and J. Zhao, Division of Research Affairs, South China University of Tropical Agriculture, Danzhou, Hainan, China

Poster 6-14. **Effect of Agitation and Aeration on the Production of Hexokinase by *Saccharomyces cerevisiae***, M. Vitolo, D. P. Silva, and A. Pessoa, Jr., Department of Biochemical and Pharmaceutical Technology, University of São Paulo, São Paulo, SP, Brazil

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Poster 6-25. **Kinetic and Mass Transport Parameters in Maltotriose Hydrolysis Catalyzed by Glucoamylase Immobilized on Macroporous Silica and Wrapped in Pectin Gel**, R. L. C. Giordano, L. Gonçalves, G. Suzuki, and R. Giordano, Departamento de Engenharia Química, Universidade Federal de São Carlos, São Carlos, SP, Brazil; and Departamento de Engenharia Química, Universidade Federal do Ceará, Fortaleza, CE, Brazil

Poster 6-26. **Selection of Stabilizing Additive for Lipase Immobilization on Controlled-Pore Silica by Factorial Design**, H. F. De Castro, C. M. F. Soares, M. H. A. Santana, and G. M. Zanin, Departamento de Engenharia Química, Faculdade de Engenharia Química de Lorena, Lorena, São Paulo, Brazil; Departamento de Biotecnologia, Faculdade de Engenharia Química, UNICAMP, Campinas, SP, Brazil; and Departamento de Engenharia Química, Universidade Estadual de Maringá, Maringá, PR, Brazil

Poster 6-27. **Kinetic Studies of Lipase from *Candida rugosa*: A Comparative Study of the Free and the Immobilized Enzyme on Porous Chitosan Beads**, G. M. Zanin, E. B. Pereira, F. F. De Moraes, and H. F. De Castro, Chemical Engineering Department, State University of Maringá, Maringá, PR, Brazil; and Departamento de Engenharia Química, Faculdade de Engenharia Química de Lorena, Lorena, SP, Brazil

Poster 6-28. **Catalytic Properties of Free and Immobilized Cellobiose**, G. M. Zanin, L. P. V. Calsavara, and F. F. De Moraes, Chemical Engineering Department, State University of Maringá, Maringá, PR, Brazil

Poster 6-29. **Characterization of the Cyclomaltodextrin Glucanotransferase from *Bacillus firmus* Strain 37**, F. F. De Moraes, G. Matioli, and G. M. Zanin, Pharmacy and Pharmacology Department and Chemical Engineering Department, State University of Maringá, Maringá, PR, Brazil

Poster 6-30. **Cloning and Expression in *Escherichia coli* of Xylanase from the Thermophilic *Thermomyces lanuginosus* IOC-4145**, C. M. Andrade, M. C. T. Damaso, O. B. Martins, R. M. Albano, and N. Pereira, Jr., Department of Biochemical Engineering, Escola de Química, Department of Medical Biochemistry, ICB/CCS, and Department of Biochemistry, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil

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Poster 6-32. **Xylanase Production by *Aspergillus awamori* and the Influence of Different Nitrogen Sources**, N. Pereira, Jr., J. L. S. Lemos, and M. C. A. Fontes, Departamento de Engenharia Química, Escola de Química, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil

REGISTRATION

Advance Registration. To register for the symposium, complete the form provided herein and mail it with your check made payable to Twenty-Second Symposium on Biotechnology. Pre-registration is encouraged. The Symposium registration fee of \$400.00 (\$450.00 if payment is received after April 3, 2000) includes admission to all technical sessions, receptions, continental breakfast each day, refreshment breaks, the Monday evening banquet, the Tuesday luncheon buffet, and a copy of the published Proceedings. The registration fee for full-time students is \$125. One-day registration is \$150 (\$175.00 if payment is received after April 3, 2000). Fees must be paid in U.S. currency, drawn against a U.S. bank. If unable to send funds drawn against a U.S. bank, you must include an additional \$50.00 to cover all bank processing fees. MC/Visa accepted.

Refunds/Cancellations. We understand that sometimes plans change. All refund requests submitted in writing and post-marked by April 1, 2000 will be issued by full. Substitutions may be made at any time.

On-site Registration. The registration desk and information desk, located on the lower level of the Park Vista Hotel, will be open Sunday, May 7, from 10:00 am to 9:00 pm and will be maintained throughout the symposium.

Special Needs. The planning committee wants to ensure your comfort and convenience at the symposium. If you have any special needs, please indicate these on your registration form, and we will call you to make appropriate arrangements.

Cancellations and Refunds. Cancellation of advance registration will be accepted if received before April 18, 2000.

COMMUNICATION WITH THE STAFF

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New Knoxville/Oak Ridge Area code (865) - formerly (423)

SITE DESCRIPTION

Great Smokies Area. Gatlinburg lies in a valley 443 m above sea level at the base of the Great Smokies' third-highest peak, Mt. LeConte (2020 m), and adjacent to the Great Smoky Mountains National Park. Early May in the mountains is usually very pleasant with mild days and cool nights. The town itself is a resort with interesting shops, some featuring handicrafts native to the Appalachian region. Numerous hiking trails of varying difficulty traverse the Park. Those who enjoy backpacking may want to consider hiking in the backcountry the weekend before or after the symposium.

Transportation. Air travel reservations should be made to Knoxville, Tennessee. Transportation from Knoxville's McGee Tyson Airport to Gatlinburg may be arranged with Executive Limo (800-432-7923). The fee is \$45.00 per person, \$30 each for two persons, or \$25.00 each for groups of three or more (one way) if the reservation is made in advance of your arrival at the airport. Rental cars are available at the airport.

SOCIAL PROGRAM AND TOURS

Sunday, May 7 Evening reception for attendees and their guests (light snacks, no charge)

Monday, May 8 Morning Guest Program for guests of attendees (continental breakfast and information on appropriate excursions will be provided). The Guest Program fee includes participation on Tuesday and Wednesday mornings as well. Fee for guests of attendees: \$20.00

Evening Banquet at the Park Vista Hotel (preceded by a social hour). The symposium fee includes the social hour and banquet, but guests of attendees must purchase tickets. Fee for guests of attendees: \$30.00

Wednesday, May 10 Free Afternoon. Local hiking trips can be arranged at no additional cost for any date.

Evening Poster Session with dinner buffet for registered attendees. Guests of attendees may purchase tickets (\$25.00).

LODGING

The Park Vista Resort Hotel is a premier resort and convention center overlooking Gatlinburg. Every room boasts a beautiful view of the Smokies. Reservations for lodging should be made directly with the Park Vista. A special Symposium room rate of \$73.00 (including taxes) is being offered for the nights of May 7-11, 2000. Rooms should be reserved with a credit card by April 3, 2000, to guarantee lodging at the Symposium rates. Reservations received after this date will be on a rates-available, space-available basis only. To reserve your room, please contact the Park Vista reservation department at (800) 421-7275 or (865) 436-9211 and request the 22nd Symposium rate. The hotel requires either a 1-night deposit or a credit card guarantee. Deposits are fully refundable if canceled 72 hours in advance of scheduled arrival. Park Vista's address is 705 Cherokee Orchard Rd., Gatlinburg, TN 37738. Their fax number is (865) 430-7533. Check-in time is 4:00 pm. The hotel will make reasonable efforts to accommodate early arrivals. Check-out time is 11:00 am.

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22nd Symposium on Biotechnology
for Fuels and Chemicals

May 7-11, 2000

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Table with 3 columns: Registration Fee, Amount, and Currency. Rows include Late Registration Fee, Single-day Registration Fee, Student Registration Fee, and Late Single-day Registration Fee. Includes checkbox for Prefer Vegetarian Meals.

Options*

Table with 3 columns: Option, Amount, and Currency. Rows include Name of guest for badge, Monday evening banquet, Wednesday evening dinner buffet, and Guest Program.

Total amount enclosed

If paying by MasterCard or Visa, please enter the following information:

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*Tickets for the optional activities should be picked up at the registration desk upon arrival at the Symposium. Other social excursions and tours may be arranged through Park Vista Hotel Guest Services.

Make Check Payable to: 22nd Symposium on Biotechnology. Payment for the Symposium must be by cash, check, VISA, or MC.

Cancellation and Refunds: Cancellation of advance registration will be accepted if received before April 3, 2000.