

**INSTITUTE FOR POLYMER RESEARCH (IPR)
UNIVERSITY OF WATERLOO
WATERLOO, ONTARIO N2L 3G1**

NEWSLETTER 2010

1. STEPS IN 2011 FOR THE SELECTION OF A NEW DIRECTOR

As per IPR's constitution and traditional practices, Professor Penlidis continued handling IPR's affairs until the end of 2010, due to the Fall of 2010 IPR report for Senate Institute status renewal from 2010 to 2015. IPR did, indeed, receive (with accolades) another 5-year renewal from the University of Waterloo Senate Research Council in November, 2010, until the end of 2015. As of January 1, 2011, the most senior IPR member, Professor Costas Tzoganakis (Chemical Engineering), has been appointed as Interim Director (January 1, 2011 – April 30, 2011), during which period he, along with the Chairs of Chemical Engineering and Chemistry, will lead the selection of IPR's new director, via a committee and following past practices. The new IPR director will start on May 1, 2011, for the first (usual) term of three years.

The new director can certainly count on Professor Penlidis' help and the help and cooperation from all academic and industrial members that Professor Penlidis has enjoyed over many years.

See Appendix 1 for a note from the outgoing Director, Professor Penlidis, which also appeared in last year's newsletter.

2. ANNUAL IPR SYMPOSIUM

The 33rd Annual IPR Symposium will be held May 10, 2011. A schedule and registration forms have been circulated electronically, as usual.

Many thanks to all who participated in the 2010 Symposium (an audience of about 60 people). IPR received very positive feedback regarding the topics covered. A list of industrial participants and the 2010 program are attached (Appendix 2).

3. IPR INDUSTRIAL MEMBERS

An up-to-date list of our current industrial members is attached (Appendix 3).

4. IPR PREPRINTS

During 2010, the IPR office sent out 23 preprints to our members (Appendix 4).

5. RESEARCH PROGRAMS

We have more than 90 research personnel (excluding faculty) involved in polymer research at the University of Waterloo. Industrial members may find it interesting to keep up to date with the various research projects that are underway (see list attached of research personnel, Appendix 5). For more information on any project, please email/call the appropriate supervisor or the IPR office at <ipr@uwaterloo.ca>, 519/888-4789.

6. RECENTLY GRADUATED STUDENTS

T. Duever

MASc	ChE	Dorschner, D.	Multicomponent Free Radical Polymerization Model Refinements and Extensions with Depropagation (co-supervised with A. Penlidis)
MASc	ChE	Kazemi, N.	Reactivity Ratio Estimation Aspects in Multicomponent Polymerizations at Low and High Conversion Levels. (co-supervised with A. Penlidis, currently PhD candidate)
PhD	ChE	Omidbakhsh, N.	Computer Aided Product Design and Development for Peroxide Based Disinfectants (co-supervised with A. Elkamel and P. Reilly, Vice-President Research, Virox Technologies, Oakville, Ontario)
PhD	ChE	Bin Shams, M.	Observability and Economic Aspects of Fault Detection and Diagnosis using CUSUM-based Multivariate Statistics (co-supervised with H. Budman, Lecturer, University of Bahrain)

J. Duhamel

Ph.D.	Chem	Siu, H.	Fluorescence and Rheological Studies of Surfactant-Associative Polymers Associations
MASc.	Chem	Wang, Y.	Correlation between the Binding and Associative Strength of Modified PIBSA-Based Dispersants
MASc.	Chem	Yip, J.	Study of the Aggregation in Water of Pyrene End-labeled Poly(N-isopropylacrylamide)s

N. McManus

MASc	ChE	Haque, M.	A Kinetic Study of Acrylamide/Acrylic Acid Copolymerization
MaSc	ChE	Wu, Y.R.	Polypropylene Modified by Polydimethylsiloxane in Catalytic Cross Metathesis Reactions" (co-supervised with C. Tzoganakis)

A. Penlidis

MASc	ChE	Kazemi, N.	Parameter estimation in terpolymerization (PhD, Univ. of Waterloo)
MASc	ChE	Haque, M.	Water-soluble polymers based on acrylamide (with McManus) (currently seeking employment)
MASc	ChE	Behjat, Y.	Tensile properties of pipes (with Polak, Civ Eng) (with Construction Management, Toronto)
MASc	ChE	Dorschner, D.	Modelling multicomponent polymerizations (with Duever) (with Durez Canada, Fort Erie, ON)

J. Soares

PhD ChE Maneshi, A. In-Situ Ethylene Polymerization with Organoclay-Supported Metallocenes for the Preparation of Polyethylene-Clay Nanocomposites.

M. Tam

MASc ChE Leung, A. Novel pH-responsive hybrid peptide block copolymers for intracellular delivery applications

MASc ChE Yuen, F. Cyclodextrin Assisted Self-Assembly of Stimuli-Sensitive Block Copolymers in Aqueous Media

MASc ChE Dhar, N. Novel Cellulose Nanoparticles for Potential Cosmetic and Pharmaceutical Applications

MASc ChE Khouri, S. Experimental Characterisation and Theoretical Calculations of Responsive Polymeric Systems

C. Tzoganakis

MASc ChE Wu, Y.R. Polypropylene Modified by Polydimethylsiloxane in Catalytic Cross Metathesis Reactions (co-supervised with Neil McManus)

PhD ChE Yeetsorn, R. Development of Electrically Conductive Thermoplastic Composites for Bipolar Plate Application in Polymer Electrolyte Membrane Fuel Cell (co-supervised with Michael Fowler)

E. Vivaldo-Lima

M.Eng ChE UNAM Lira-Ponce, D.E. Evaluation and performance analysis of proposals for HF-removal in alkylate product

M.Eng ChE UNAM Fletes-Vázquez, S. Suspension polymerization of styrene/divinylbenzene in the presence of a RAFT controller

7. ACADEMIC MEMBERS OF THE INSTITUTE FOR POLYMER RESEARCH

Professors:	R. Dhib	Chem Eng.	Ryerson
	T.A. Duever	Chem Eng.	Waterloo
	J. Duhamel	Chemistry	Waterloo
	X. Feng	Chem Eng.	Waterloo
	M. Gauthier	Chemistry	Waterloo
	N. McManus	Chem Eng.	Waterloo
	A. Penlidis, Director	Chem Eng.	Waterloo
	L.C. Simon	Chem Eng.	Waterloo
	J.B.P. Soares	Chem Eng.	Waterloo
	P. Sullivan	Mech Eng.	Waterloo
	M. Tam	Chem Eng.	Waterloo
	C. Tzoganakis	Chem Eng.	Waterloo
	E. Vivaldo-Lima	Chem Eng.	UNAM, Mexico

For a brief description of research interests and projects, along with contact information, please visit the following web link: <http://www.ipruw.com/contact/faculty-ria.htm>

8. MEMBER COMPANIES—2010

Currently we have **15 member companies**: (refer also Appendix 3)
(* joined in 2010)

BASF SE

Braskem S.A.

CID, Centro de Investigacion Desarrollo Tecnologico, Mexico

CIQA, Saltillo, Mexico

Compuplast Canada Inc.

*Eclipse Scientific, Waterloo

Lanxess Inc.

Materials Research Institute, Waterloo

OMNOVA Solutions Inc.

PolyVation, The Netherlands

Princeton Polymer Consultants, USA

SABIC Europe, B.V.

Sober Steering Sensors

SRC/PAVACO

Sumitomo Chemical Co., Japan

9. STUDENT AWARDS

M. Gauthier

Ala Alturk, Saudi Arabia Scholarship

Yahya Alzahrany, Saudi Arabia Scholarship

A. Penlidis

A. Nabifar, NSERC Scholar

10. FACULTY AWARDS

J. Duhamel

Tier-2 Canada Research Chair

A. Penlidis

Tier 1 Canada Research Chair (2002-2008; 2009-2015)

E. Vivaldo-Lima

“Heberto Castillo Martínez 2010 Award”, “Innovation category”, for “Mexicans under 45 years old”, granted by the Mexico City Government, through its Science & Technology Institute (ICyT-DF). Mexico City, October 2010.

11. FULL REFEREED JOURNAL PAPERS

T. Duever

Kazemi, N., T.A. Duever and A. Penlidis. Investigations on Azeotropy in Multicomponent Polymerizations. *Chemical Engineering & Technology*, **33**(11), 1841-1849.

Al-Saleh, M.A., J.B.P Soares and T.A. Duever. Integrated Deconvolution Estimation Model. A Parameter Estimation Methodology for Ethylene/ α -Olefin Copolymers Made with Multiple-Site Type Catalysts. *Macromolecular Reaction Engineering*, 4 (9-10), 578-590.

Washington, I.D., T.A. Duever and A. Penlidis. Mathematical Modeling of Acrylonitrile-Butadiene Emulsion Copolymerization: Model Development and Validation. *J. Macromol. Sci., Pure and Appl. Chem. (JMS-PAC)*, 47(8), 747-769.

Bin-Shams, M.A., H. Budman and T.A. Duever. Finding the Trade-off between Observability and Economics in the Fault Detection of Chemical Processes. Available online doi:10.1016/j.compchemeng.2010.04.006, *Computers in Chemical Engineering*.

Bin-Shams, M.A., H.M. Budman and T.A. Duever. Enhancing Fault-Observability by the Use of Feedback Control. *Industrial and Engineering Chemistry Research*, available online, doi:10.1021/ie101238q.

Omidbakhsh, N., A. Elkamel, T.A. Duever and P.M. Reilly. Combining Design of Experiments Techniques, Connectionist Models, and Optimization for the Efficient Design of New Product Formulations. *Chemical Product and Process Modeling*, 5(1), Article 11, 1-18.

Omidbakhsh, N., T.A. Duever, A. Elkamel and P.M. Reilly. A Bayesian Experimental Design Approach for Assessing New Product Performance: An Application to Disinfectant Formulation. *Canadian Journal of Chemical Engineering*, 88(1), 88-94.

Omidbakhsh, N., T.A. Duever, A. Elkamel and P.M. Reilly. A Systematic Statistical based Approach for Product Design: Application to Disinfectant Formulations. *Industrial and Engineering Chemistry Research*, 49(1), 204-209.

J. Duhamel

M. Ingratta, M. Mathew and J. Duhamel. How Switching the Substituent of a Pyrene Derivative from a Methyl to a Butyl Affects the Fluorescence Response of Polystyrene Randomly Labeled with Pyrene. Special issue in honor of Mitchell A. Winnik. *Can. J. Chem.*, 88, 217-227.

H. Siu, J. Duhamel, D. Sasaki and J.L. Pincus. Nanodomain Formation in Lipid Membranes Probed by Time-Resolved Fluorescence. *Langmuir*, 26, 10985-10994.

J. Yip, J. Duhamel, G. Bahun, and A. Adronov. A Study of the Branch Ends of a Series of Pyrene-Labeled Dendrimers Based on Pyrene Excimer Formation. *J. Phys. Chem. B*, 114, 10254-10265.

C. Keyes Baig, J. Duhamel. Electron Transfer between Physically Bound Electron Donors and Acceptors: A Fluorescence Blob Model Approach. *J. Phys. Chem. B*, 114, 13950-13960.

X. Feng

Chen, Y., Y. Zhang and X. Feng. An improved approach for determining permeability and diffusivity relevant to controlled release. *Chemical Engineering Science*, 65, 5921-5928.

de Souza, R.R., R. Bergamasco, S.C. da Costa, X. Feng, S.H.B. Faria and M.L. Gimenes. Recovery and purification of lactose from whey. *Chemical Engineering and Processing: Process Intensification*, 49, 1137-1143.

Du, J.R., L. Liu, A. Chakma and X. Feng. Using poly(N,N-dimethylaminoethyl methacrylate)/polyacrylonitrile composite membranes for gas dehydration and humidification. *Chemical Engineering Science*, 65, 4672-4681.

Zou, Y., Z. Tong, K. Liu and X. Feng. Modeling of esterification in a batch reactor coupled with pervaporation for production of n-butyl acetate. *Chin J. Catal. (English edition, published by Elsevier)*, 31, 999-1005. (Invited contribution in celebration of the Journal's 30th Anniversary).

Xu, J., C. Gao and X. Feng. Thin-film-composite membranes comprising of self-assembled polyelectrolytes for separation of water from ethylene glycol by pervaporation. *Journal of Membrane Science*, 352, 197-204.

Francisco, G., A. Chakma and X. Feng. Separation of carbon dioxide from nitrogen using diethanolamine-impregnated poly(vinyl alcohol) membranes. *Separation and Purification Technology*, 71, 205-213.

Du, J.R., L. Liu, A. Chakma and X. Feng. A study of gas transport through interfacially formed poly(N,N-dimethylaminoethyl methacrylate) membranes. *Chemical Engineering Journal*, 156, 33-39.

M. Gauthier

Gauthier, M., A. Munam. Synthesis of 1,4-Polybutadiene Dendrimer–Arborescent Polymer Hybrids. *Macromolecules*, 43, 3672-3681.

Erwin, B. M., M. Cloitre, M. Gauthier, D. Vlassopoulos. Dynamics and Rheology of Colloidal Star Polymers. *Soft Matter*, 6, 2825-2833.

Gauthier, M., W.-Y. Lin, S.J. Teertstra, C. Tzoganakis. Fluorine-containing arborescent polystyrene-graft-polyisoprene copolymers as polymer processing additives. *Polymer*, 51, 3123-3129.

Sanchez Cadena, L.-E., M. Gauthier. Phase-Segregated Dendrigrft Copolymer Architectures (Invited review – open access). *Polymers*, 2, 596-622.

N. McManus

Nabifar, A., N.T. McManus, E. Vivaldo-Lima, P.M. Reilly, and A. Penlidis. Optimal Bayesian Design of Experiments Applied to Nitroxide-Mediated Radical Polymerization. *Macromolecular Reaction Engineering*, 4, 387-402.

Nogueira, T.R., M.C. Goncalves, L.M.F.Lona, E. Vivaldo-Lima, N. McManus and A. Penlidis. Effect of initiator type and concentration on polymerization rate and molecular weight in the bimolecular nitroxide-mediated radical polymerization of styrene. *Adv. in Polym. Tech.* 29, 11-19.

Nabifar A, N.T. McManus, E. Vivaldo-Lima, and A. Penlidis. Kinetic Aspects of Styrene Polymerization with an Acyloxyamine. *J. Macromol. Sci., Part A: Pure and Appl. Chem.*, 47, 496-502.

Nabifar, A., N.T. McManus, E. Vivaldo-Lima, A. Penlidis. A Sequential Iterative Scheme for Design of Experiments in Complex Polymerizations. *Chemical Engineering Technology*, **33**, 1814-1824.

Nogueira, T.R., L.M.F. Lona, N.T. McManus, E. Vivaldo-Lima, A. Penlidis. Nitroxide-mediated radical copolymerization of styrene and divinylbenzene: increased polymerization rate by using TBEC as initiator. *Journal of Material Science*, **45**, 1878-1884.

Zhou M., N.T. McManus, E. Vivaldo-Lima, L.M.F. Lona, and A. Penlidis. Kinetics of Nitroxide Mediated Radical Polymerization of Styrene with Unimolecular Initiators. *Macromolecular Symposia*, **289**, 95 – 107.

A. Penlidis

Jaramillo-Soto, G., M. Ramirez-Cupido, J.A. Tenorio-Lopez, E. Vivaldo-Lima and A. Penlidis (2010). Simulation of polymerization kinetics and molecular weight development in the microwave activated emulsion polymerization of styrene using EMULPOLY. *Chem. Eng. Technol.*, **33** (11), 1888-1892.

Kazemi, N., T.A. Duever and A. Penlidis (2010). Investigations on azeotropy in multicomponent polymerizations. *Chem. Eng. Technol.*, **33** (11), 1841-1849.

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Alvarado-Contreras, J.A., M. A. Polak and A. Penlidis (2010). Constitutive modeling of damage evolution in semicrystalline polyethylene. *J. Eng. Mater. Technol.*, **132**, #041009, 1-13.

Cheng, J.J., M. A. Polak and A. Penlidis (2010). An alternative approach to estimating parameters in creep models of high-density polyethylene. *Polym. Eng. Sci.*, doi 10.1002/pen.21838.

Washington, I.D., T.A. Duever and A. Penlidis (2010). Mathematical modeling of acrylonitrile-butadiene emulsion copolymerization: Model development and validation. *J. Macromol. Sci., Pure and Appl. Chem.* **47** (8), 747-769.

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Cheng, J.J., J.A. Alvarado-Contreras, M.A. Polak and A. Penlidis (2010). Chain entanglements and mechanical behavior of high density polyethylene. *J. Eng. Mater. Techn.*, 132, #11016, pgs. 1-7.

Zhou, M., N.T. McManus, E. Vivaldo-Lima, L.M.F. Lona and A. Penlidis (2010). Kinetics of nitroxide-mediated radical polymerization of styrene with unimolecular initiators. *Macromol. Symp.*, 289, 95-107.

J.B.P. Soares

McKenna, TFL, A Di Martino, G Weickert, JBP Soares. Particle growth during the polymerisation of olefins on supported catalysts, 1 – Nascent polymer structures. *Macromol React Eng*, 4, 40-64.

Choi, Y. JBP Soares. Ethylene slurry polymerization using nickel diimine catalysts covalently attached onto MgCl₂-based supports. *Polymer*, 51, 2271-2276.

Choi, Y., SY Shin, JBP Soares. Preparation of polyethylene/MMT nanocomposites through in-situ polymerization using a MMT-supported nickel diimine catalyst. *Macromol Chem Phys* 211, 1026-1034.

Al-Saleh, M.A., JBP Soares, TA Duever. Integrated deconvolution estimation model. A parameter estimation methodology for ethylene/ α -olefin copolymers made with multiple-site-type catalysts. *Macromol React Eng*, 4, 578-590.

Choi, Y., JBP Soares. Supported hybrid early and late transition metal catalysts for the synthesis of polyethylene with tailored molecular weight and chemical composition distributions. *Polymer*, 51, 4713-4725.

Alshaiban, A., JBP Soares. Mathematical modeling of the microstructure of polypropylene made with Ziegler-Natta catalysts in the presence of electron donors. *Macromol React Eng*, 4, DOI: 10.1002/mren.201000036

Maneshi, A., JBP Soares, LC Simon. Polyethylene-clay nanocomposites made with metallocenes supported on different organoclays. *Macromol Chem Phys*, 211, DOI: 10.1002/macp.201000432.

Michael Tam

Yuen, F., Tam K.C.. Cyclodextrin-Assisted Assembly of Stimuli-Responsive Polymers in Aqueous Media. *Soft Matter*, 6, 4613-4630. Top Ten Articles in *Soft Matter* (September 2010)

Tan B.H., Pelton R.H., Tam K.C. Microstructure and Rheological Properties of Thermo-Responsive Poly(N-isopropylacrylamide) Microgels. *Polymer*, 51, 3238-3243.

Wang, C., Wyn-Jones E., Tam, K.C. Complexation between Amine- and hydroxyl-terminated PAMAM Dendrimers and Sodium Dodecyl Sulfate. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 364, 49-54.

Lee, E.S.M., Shuter B., Chan J., Chong M.S.K., Ding J., Teoh S.H., Beuf O., Briguet A., Tam K.C., Choolani M., Wang S.C. The use of microgel iron oxide nanoparticles in studies of magnetic resonance relaxation and endothelial progenitor cell labeling. *Biomaterials*, 31 (12), 3296-3306.

Tan, B.H., Tam K.C., Dupin D., Armes S.P. Rheological Behavior of Acid-Swellable Cationic Copolymer Latexes. *Langmuir*, 26 (4), 2736-2744.

He, E.; Yue, C. Y.; Tam, K. C. Binding and Release Studies of a Cationic Drug from a Star-Shaped Four-arm Poly(ethylene oxide)-b-poly(methacrylic acid). *Journal of Pharmaceutical Sciences*, 99 (2), 782-793.

C. Tzoganakis

K. Xiao and C. Tzoganakis. An Experimental Study of Single-Screw Extrusion of HDPE-Wood Composites. *Adv. Polym. Tech.*, 29, 197-218.

E. Ortiz-Rodriguez and C. Tzoganakis. Scaling-up a Reactive Extrusion Operation: A One-Dimensional Simulation Analysis. *Intern. Polymer Processing*, XXV, 2010, 242-250.

S-H. Zhu and C. Tzoganakis. Effect of Interfacial Strengthening in Blends of Reclaimed Rubber and Polypropylene. *J. Appl. Polym. Sci.*, 118, 1051-1059.

E. Vivaldo Lima

M. Roa-Luna, G. Jaramillo-Soto, P.V. Castañeda-Flores, and E. Vivaldo-Lima. Copolymerization Kinetics of Styrene and Divinylbenzene in the Presence of S-Thiobenzoyl Thioglycolic Acid as RAFT Agent. *Chem. Eng. Technol.*, 33(11), 1893-1899.

G. Jaramillo-Soto, M. Ramírez-Cupido, J.A. Tenorio-López, E. Vivaldo-Lima, and A. Penlidis. Simulation of Polymerization Kinetics and Molecular Weight Development in the Microwave-Activated Emulsion Polymerizations of Styrene using EMULPOLY[®]. *Chem. Eng. Technol.*, 33(11), 1888-1892.

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A. López-Luna, J.L. Gallegos, M. Gimeno, E. Vivaldo-Lima, and E. Bárzana. Lipase-catalyzed syntheses of linear and hyperbranched polyesters using compressed fluids as solvent media. *J. Molec. Catal., B: Enzymatic*, 67, 143-149.

A.G. Zitlalpopoca-Soriano, A. Flores-Tlacuahuac, E. Vivaldo-Lima. Bifurcation Analysis of a Tubular Reactor for Nitroxide-Mediated Radical Polymerization of Styrene. *Macromol. React. Eng.*, 4, 599-612.

A. Zitlalpopoca-Soriano, A. Flores-Tlacuahuac, E. Vivaldo-Lima. Grade Transition Dynamic Optimization of The Living Nitroxide-mediated Radical Polymerization of Styrene in a Tubular Reactor. *Macromol. React. Eng.*, 4(8), 516-533.

A. Nabifar, N.T. McManus, E. Vivaldo-Lima, P.M. Reilly, and A. Penlidis. Optimal Bayesian Design of Experiments Applied to Nitroxide-Mediated Radical Polymerization. *Macromol. React. Eng.*, 4, 387-402.

T.R. Nogueira, M.C. Gonçalves, L.M.F. Lona, E. Vivaldo-Lima, N. McManus, and A. Penlidis. Effect of Initiator Type and Concentration on Polymerization Rate and Molecular Weight in the Bimolecular Nitroxide-Mediated Radical Polymerization of Styrene. *Adv. Polym. Technol.*, 29(1), 11-19.

A. Nabifar, N.T. McManus, E. Vivaldo-Lima, and A. Penlidis. Kinetic Aspects of Styrene Polymerization with an Acyloxyamine. *J. Macromol. Sci., A: Pure Appl. Chem.*, 47(6), 496-502.

E. Saldívar-Guerra, R. Infante-Martínez, E. Vivaldo-Lima, A. Flores-Tlacuahuac. Returning to Basics: Direct Integration of the Full Molecular Weight Distribution Equations in Addition Polymerization. *Macromol. Theory Simul.*, 19(4), 151-157.

J.C. Hernández-Ortiz, G. Jaramillo-Soto, J. Palacios-Alquisira, and E. Vivaldo-Lima. Modeling of Polymerization Kinetics and Molecular Weight Development in the Microwave-Activated RAFT Polymerization of Styrene. *Macromol. React. Eng.*, 4(3-4), 210-221.

G. Jaramillo-Soto, P.R. García-Morán, and E. Vivaldo-Lima. Effect of Stabilizer Concentration, Pressure and Temperature on Polymerization Rate and Molecular Weight Development in RAFT Polymerization of MMA in scCO₂. *Macromol. Symp.*, 289(1), 149-154.

M. Zhou, N.T. McManus, E. Vivaldo-Lima, L.M.F. Lona, and A. Penlidis. Kinetics of Nitroxide Mediated Radical Polymerization of Styrene with Unimolecular Initiators. *Macromol. Symp.*, 289(1), 95-107.

T.R. Nogueira, L.M.F. Lona, N.T. McManus, E. Vivaldo-Lima, A. Penlidis. Nitroxide-mediated radical copolymerization of styrene and divinylbenzene: increased polymerization rate by using TBEC as initiator. *J. Mater. Sci.*, 45(7), 1878-1884.

A. García Villegas, M. A. Ocampo, E. Saldívar-Guerra, B. García-Gaitán, E. Vivaldo-Lima, G. Luna-Barcenas. Modified Frontal Polymerization of Poly(methyl methacrylate). *J. Appl. Polym. Sci.*, 115, 1289-1295.

12. PAPERS IN FULL IN REFEREED CONFERENCE PROCEEDINGS

T. Duever

M. Bin-Shams, T. Duever and H. Budman, "Fault-Detection using CUSUM techniques with applications to the Tennessee Eastman Problem", Proceedings of 9th International Symposium on Dynamics and Control (2010 DYCOPS), paper MOMT4.1, Leuven, Belgium

C. Tzoganakis

E. Ortiz and C. Tzoganakis. 3D Simulations of a Reactive Flow in Screw Elements of Closely Intermeshing Twin Screw Extruders: Conventional and Variable Speed Extruders. Proceedings of the 68th Annual Technical Conference of the Society of Plastics Engineers, Orlando, FL, USA, pp. 447-451.

S.-H. Zhu, G. He, P. Mutyala, C. Tzoganakis, T.A. Duever, R. Clark, D. Ross, and P.V. Laren. On-Line Monitoring of Polymer Blend Composition by Emission FTIR Spectroscopy. Proceedings of the 68th Annual Technical Conference of the Society of Plastics Engineers, Orlando, FL, USA, pp. 1220-1225.

M. Meysami, S. Zhu, and C. Tzoganakis. Effect of Incorporation of Devulcanized Rubber on the Properties of a Virgin Tire Compound. Proceedings of the 68th Annual Technical Conference of the Society of Plastics Engineers, Orlando, FL, USA, pp. 1657-1661.

13. CONFERENCE PRESENTATIONS/INVITED SEMINARS

T. Duever

M. Bin-Shams, T.A. Duever and H. Budman. Fault Detection and Diagnosis: Observability and Isolability. Canadian Conference of Chemical Engineering, Saskatoon, Saskatchewan, October 2010.

S. Masoumi and T.A. Duever. Model Discrimination for the Modeling of Polymerization Systems Using Markov Chain Monte Carlo (MCMC) Methods. Canadian Conference of Chemical Engineering, Saskatoon, Saskatchewan, October 2010.

J. Duhamel

J. Duhamel. Radical Improvements in the Analysis of the Kinetics of Pyrene Excimer Formation and their Implication to the Study of Polymeric Systems. Department of Chemistry, University of Toronto, January 11th, 2010.

J. Duhamel. Pyrene Excimer Formation and its Applications to Study the Internal Dynamics of Polymeric Systems. Department of Chemistry, McMaster University, Hamilton, March 18th, 2010.

J. Duhamel. Characterizing the Behaviour of Maleated Polyolefins by Fluorescence. Afton Chemical Research Center, Richmond, VA, USA, May 28th, 2010.

J. Duhamel. Colloidal Systems Studied by Fluorescence. Cabot Research Center, Billerica, MA, USA, July 9th, 2010.

H. Aslam and J. Duhamel. Chain Dynamics of Ruthenium-Labeled Poly(L-lysine) Probed by Fluorescence. XIX IMRC, Cancun, Mexico, August 15-19, 2010.

G. Zaragoza-Galán, J. Yip, J. Duhamel and E. Rivera. Preparation and Optical Properties of Novel Fréchet-Type Dendrons Containing Pyrenyl Groups. XIX IMRC, Cancun, Mexico, August 15-19, 2010.

J. Duhamel. Length Scales in Macromolecules Probed by Fluorescence. Plenary Lecture at QuimiUNAM 2010, Mexico City, Mexico, November 24, 2010.

J. Duhamel. Using Fluorescence to Probe Hydrophobic Interactions in Water at the Molecular Level. Colloquium at the Institute for Investigations of Materials, UNAM, Mexico, November 26, 2010.

C. Keyes-Baig and J. Duhamel. Probing Hydrophobic Interactions with Pyrene-Labeled Amphiphilic Macromolecules. Pacificchem 2010, Honolulu, December 15-20, 2010.

H. Aslam and J. Duhamel. Chain Dynamics of Ruthenium-Labeled Poly(L-lysine) Probed by Fluorescence. 93rd CSC Conference in Toronto, ON, Canada, May 29-June 2, 2010 and 34th High Polymer Forum, Ste Adèle, QC, Canada, Aug 18th – 20th, 2010.

C. Keyes-Baig, J. Duhamel, J. Akbar and S.D. Wettig. Studying the Interactions of a Gemini Surfactant with DNA by Fluorescence. 93rd CSC Conference in Toronto, ON, Canada, May 29-June 2, 2010 and 34th High Polymer Forum, Ste Adèle, QC, Canada, Aug 18th – 20th, 2010.

Y. Wang and J. Duhamel. Synthesis and Characterization of Ethylene Carbonate Modified Polyisobutylene Succinimide Dispersants. 34th High Polymer Forum, Ste Adèle, QC, Canada, Aug 18th – 20th, 2010.

S. Chen, J. Duhamel, G.J. Bahun and A. Adronov. Accounting for Fluorescent Impurities with a “Model Free” Analysis in the Study of Pyrene-Labeled Macromolecules. 34th High Polymer Forum, Ste Adèle, QC, Canada, Aug 18th – 20th, 2010.

X. Feng

Kundu, P., A. Chakma and X. Feng. Hybrid membrane process for CO₂ removal from flue gases and AspenPlus simulation. 60th Canadian Chemical Engineering Conference, Saskatoon, SK, October 24-27, 2010.

Du, J.R., G.J. Francisco, P. Kundu, A. Chakma and X. Feng, Hollow fiber membranes for carbon dioxide separation from flue gas and landfill gas: Experimental and modeling studies. 240th American Chemical Society National Meeting (Symposium: Emerging Applications in Membrane Science and Technology), Boston, MA, Aug 22-26, 2010.

Xu, J. C. Gao and X. Feng, Surface modification of aromatic polyamide membranes for reverse osmosis, gas separation and pervaporation. 20th Annual North American Membrane Society Meeting, Washington, DC, July 17-22, 2010.

Chen Y. and X. Feng. An improved approach for determining permeability and diffusivity relevant to controlled release of drugs. 20th Annual North American Membrane Society Meeting, Washington, DC, July 17-22, 2010.

Xu, J., C. Gao and X. Feng. Polyelectrolyte membranes assembled layer-by-layer for separation of water from ethylene glycol. International Conference on Pervaporation and Vapor Permeation, Torun, Poland, April 18-21, 2010.

Invited Lectures:

- Extraction of aroma compounds from aqueous solutions, Kraft Foods Global Research and Technology Center, Glenview, IL, Oct 12, 2010.
- Pervaporation for extraction of butanol from aqueous solutions, Tianjin Polytechnic University, Tianjin, China, June 9, 2010.
- Surface modification of aromatic polyamide membranes by self assembly of polyelectrolytes, Tianjin Polytechnic University, Tianjin, China, June 9, 2010.
- Poly(ether-b-amide) membranes for gas separation and pervaporation, Guangxi University, Nanning, China, June 3, 2010.
- Introduction to Chemical Engineering Thermodynamics, a lecture series presented at Guangxi University, Nanning, China, May 31 – June 2, 2010.
- Separation of low-concentration butanol from aqueous solutions by pervaporation, Chungnam National University, Daejeon, Korea, May 19, 2010.

- Separation of CO₂ from flue gas using hollow fiber membranes, Korea Research Institute of Chemical technology, Daejeon, Korea, May 18, 2010.
- Olefin/paraffin separation by facilitated transport using composite membranes, Hanyang University, Seoul, Korea, May 17, 2010.
- Theory and application of pervaporation processes, a series of 4 lectures presented at Myongji University, Yongin, Korea, May 12 – 15, 2010.
- Membranes as a sustainable technology for environmental and energy applications, LS Industrial Systems Co., Anyang, Korea, May 11, 2010.

M. Gauthier

Gauthier, M. Arborescent Polymers: Synthetic Strategies for Properties Control. 2nd Sino-Canadian Conference, May 2010, Suzhou, China.

Whitton, G., Gauthier, M. Arborescent Polypeptide Micelles. Pacifichem 2010 Conference, December 2010, Honolulu, HI.

Whitton, G., Gauthier, M. Arborescent Polypeptide Micelles. 93rd Canadian Chemistry Conference, May 2010, Toronto, ON.

Hall, T., Gauthier, M., Duhamel, J. Side-chain Dynamics of Arborescent Poly(L-Glutamic Acid) Monitored by Fluorescence Spectroscopy. 33rd Canadian High Polymer Forum, August 2010, Ste-Adèle, QC.

Invited Lectures:

- Polymères Arborescents: Stratégies Synthétiques pour le Contrôle des Propriétés de Polymères Greffés à Architecture Dendritique. Université Bordeaux 1/CNRS, Bordeaux, France, June 2010.
- Contrôle de la Morphologie dans la Préparation de Nanoparticules Métalliques par « Templating » à l'aide de Copolymères Arborescents. Université Bordeaux 1/CNRS, Bordeaux, France, June 2010.
- Arborescent Polymers: Synthesis, Properties, and Applications. Queen's University, Kingston, ON, August 2010.

N. McManus

A. Nabifar, N. T. McManus, A. Penlidis and E. Vivaldo-Lima. Experimental Design under a Bayesian Framework for Complex Polymerization Processes. 10th International Workshop on Polymer Reaction Engineering, October 2010, Hamburg, Germany.

A. Penlidis

Matti, B., N. Jacob, R. Dhib and A. Penlidis (2010). Nonlinear dynamic behaviour of CSTRs for NMRP of styrene. 60th CSChE Conf., Saskatoon, SK, Oct. 24-27, 2010.

Nabifar, A., N.T. McManus, E. Vivaldo-Lima and A. Penlidis (2010). Experimental design under a Bayesian framework for complex polymerization processes. **Invited talk**, 10th International Workshop on Polymer Reaction Engineering, Hamburg, Germany, Oct. 10-13, 2010.

Penlidis, A. and C. Tzoganakis (2010). Nitroxide-mediated vs tetra-functional peroxide-controlled degradation of polypropylene and other adventures. **Invited talk**, 26th Annual Mtg of Polymer Processing Soc. (PPS-26), Banff, AB, July 4-8, 2010.

Cheng, J.J., M.A. Polak and A. Penlidis (2010). ESCR of polyethylene and its relationship to long-term strength of pipelines. **Invited talk**, Pipe Engineering Conf., Tomaszowice, Poland, June 16-18, 2010.

J.B.P. Soares

MA Parvez, IA Hussein, JBP Soares, MA Suleiman. Thermal, mechanical and rheological properties of HDPE synthesized at different polymerization conditions. PPS-26 The Polymer Processing Society, Banf, AL, Canada, July 4-8, 2010.

JBP Soares, S Mehdiabadi, Y Choi. Synthesis of linear and branched polyolefins with controlled microstructures using two single-site catalysts. Macro 2010 – 43rd IUPAC World Polymer Congress, Glasgow, UK, July 11-16, 2010.

S Anantawaraskul, K Narkchamman, K Suriya, JBP Soares. A criterion for bimodality of chemical composition distribution: Application as a benchmark for cocrystallization study of CRYSTAF and CEF. 3rd International Conference on Polyolefin Characterization, Shanghai, China, November 7-10, 2010.

A Alshaiban, JBP Soares. Effect of hydrogen, electron donor, and polymerization temperature on polypropylene microstructure. 3rd International Conference on Polyolefin Characterization, Shanghai, China, November 7-10, 2010.

AA Alghyamah, JBP Soares. Crystallization elution fractionation of LLDPE made by Ziegler-Natta and metallocene catalysts. 3rd International Conference on Polyolefin Characterization, Shanghai, China, November 7-10, 2010.

AA Alghyamah, JBP Soares. Effect of CEF run parameters on the CCD of metallocene LLDPE blends. 3rd International Conference on Polyolefin Characterization, Shanghai, China, November 7-10, 2010.

S Buaparungsri, S Anatawaraskul, JBP Soares. Theoretical analysis on chain microstructures of olefin block copolymers. 3rd International Conference on Polyolefin Characterization, Shanghai, China, November 7-10, 2010.

AA Alghyamah, A Alshaiban, JBP Soares. Study of cocrystallization effects on PE/PP blends. 3rd International Conference on Polyolefin Characterization, Shanghai, China, November 7-10, 2010.

T Macko, S Mehdiabadi, JBP Soares, R Brüll. Comparison of elution profiles obtained with CRYSTAF and with high-temperature HPLC for ethylene/1-butene and ethylene/1-octene copolymers. 3rd International Conference on Polyolefin Characterization, Shanghai, China, November 7-10, 2010.

Invited Lectures:

- Mathematical modeling of polyolefin microstructures. Dow Chemical, Freeport, Texas, USA, March 2, 2010.
- Synthesis of linear and branched polyolefins with controlled microstructures using two single-site catalysts. JAIST, Kanazawa, Japan, March 24, 2010.
- Mathematical modeling of polyolefin microstructures. Chevron-Phillips, Kingwood, Texas, USA, April 14, 2010.

- Mathematical modeling of polyolefin microstructures. LATEP 2010 Workshop, University Rey Juan Carlos, Madrid, Spain, May 27, 2010.
- Advances on polyolefin production and characterization techniques. SCG, Rayong, Thailand, August 3, 2010.
- Crystallization elution fractionation. Department of Chemical Engineering, Kasetsart University, Bangkok, Thailand, August 4, 2010.
- Mathematical modeling of olefin block copolymer microstructure. Department of Chemical Engineering, Kasetsart University, Bangkok, Thailand, August 4, 2010.
- Polymer reaction engineering and new polymeric materials. Bostik, Milwaukee, WI, USA, August 23, 2010.
- The Canadian Journal of Chemical Engineering. Current status and new initiatives. Department of Chemical Engineering, University of Calgary, Calgary, AL, October 5, 2010.
- The Canadian Journal of Chemical Engineering. Current status and new initiatives. Department of Chemical Engineering, University of Saskatchewan, Saskatchewan, SK, October 6, 2010.
- The Canadian Journal of Chemical Engineering. Current status and new initiatives. Department of Chemical Engineering, Ryerson University, Toronto, ON, December 10, 2010.
- Synthesis of polyolefins with combined single site catalysts. Department of Chemical Engineering, Ryerson University, Toronto, ON, December 10, 2010.

M. Tam

Polymeric Nanostructures for Chemical and Biomedical Applications. Nanyang Technological University, Singapore, 7 January 2010

Dynamic and static light scattering-Theory and Practice. Nanyang Technological University, Singapore, 14 January 2010

Polymeric Nanostructures for Drug/Gene Delivery Application. National Institute of Materials Science, Tsukuba, Japan, 18 February 2010

Responsive polymeric systems for personal care and related applications. Proctor & Gamble, Cincinnati, USA, June 17, 2010.

E. Vivaldo-Lima

P.R. García Morán, A Licea-Claverie, G. Jaramillo Soto and E. Vivaldo Lima. Production of hydrogels through RAFT copolymerization of HEMA with different monomers in conventional solvents and in scCO₂. XXIII Congreso Nacional de la Sociedad Polimérica de México, October 11-14, 2010, Tijuana, B.C., México.

J.C. Hernández-Ortiz and E. Vivaldo-Lima. Modeling of nitroxide-mediated radical copolymerization with crosslinking of vinyl/divinyl monomers using a polyfunctional chain approach. 10th International Workshop on Polymer Reaction Engineering, 10-13 October 2010, Hamburg, Germany.

J.C. Hernández-Ortiz and Eduardo Vivaldo-Lima. Analysis of fragmentation in linear and non linear RAFT polymerizations. 10th International Workshop on Polymer Reaction Engineering, 10-13 October 2010, Hamburg, Germany.

14. PATENTS/MAJOR TECHNICAL REPORT/CHAPTERS IN BOOKS/OTHER

A. Penlidis

Book editor, Polymer Reaction Engineering VII, Wiley-VCH, 164 pages.

Penlidis, A. and M. Bulsari (2010). "Molecular weight determination using static light scattering for polyglycerol samples" (for Univ. of Ottawa, Chem. Eng. Dept., Bio-diesel group), April 9, 2010, 6 manuscript pages. Technical proprietary report.

J. Soares

Two major technical reports on elastomeric polyolefins for ExxonMobil.

15. THE EMERGENCE OF TYROMER

This is a **very special highlight** from 2009 and that is why it is featured separately from the other activities/highlights of our usual concluding section, and repeated for this year's newsletter. **This is a great example of how IPR's "coaching" can culminate in a new company!**

Most of the information that follows has been paraphrased or taken directly from the original announcements about Tyromer from related UW websites. Although for Greek-speaking scientists "Tyromer" sounds like a "cheese-part" company, the information that follows will convince you otherwise!

Each year, North America produces 300 million scrap tires which, until now, have been difficult to recycle. Typically, they have limited low value reuse applications, such as rubber mats, and rubber crumbs that are used in playgrounds and running tracks. Over half of rubber tires are burned for their fuel value (with some of that energy used for power plants, which recovers only about 25% of the energy that originally went into producing the tire).

In the summer of 2009, with help and guidance from the Waterloo Commercialization office at UW, Costas Tzoganakis, one of the most senior members of IPR and Chemical Engineering, launched Tyromer Inc., a start-up company created and financed in part by a strategic start-up loan by the Michelin Development Corporation, and an Ontario Centres of Excellence commercialization grant. Tyromer's product is a unique, tire-derived polymer which has physical properties and strength close to virgin rubber but is made 100 percent from scrap tires using an economical, easy new way to devulcanize rubber. In an effort to reach up to 95% of original energy input, Tyromer's product can be used in applications such as feedstock for new tire manufacturing, automotive seals, retreads and a variety of other higher value products.

Tyromer has formed a strategic collaboration with Kichener based AirBoss, one of North America's largest custom rubber compounders, who have also provided valuable technical assistance in the development of Tyromer. Over the next three years, Tyromer hopes to have two full-scale plants operating in Ontario, followed by plants across North America that will be located near the rubber crumb producers.

For more details about the technology, please contact Professor Costas Tzoganakis directly.

16. OTHER HIGHLIGHTS FOR YEAR 2010

Many thanks to Dr. Carla McBain, a long-time friend of IPR, for coordinating many interesting interactions with OMNOVA Solutions Inc. IPR is grateful for OMNOVA's help for graduate student awards and scholarships.

Many thanks to Dr. Klaus-Dieter Hungenberg of BASF, a long-time friend of IPR, for coordinating many interesting interactions with BASF in Germany, USA and Canada.

During 2010, IPR had several interactions with non-member companies: Imperial Oil, Sarnia, ON; ACP/MaxTech, Waterloo, ON; Genalta Power Inc., Calgary, AB; PPG, USA, and offered assistance to many graduate students from departments other than Chemical Engineering and Chemistry: Mechanical Engineering, UW; Nanotechnology Engineering, UW; Conestoga College, Waterloo, ON; Electrical Engineering UW; and Civil Engineering, UW. In addition, the IPR office and Director respond to countless calls and emails (all requests for information) and help the public at large (who have questions on polymers) as well as other UW Institutes (e.g., WIN).

Prof. Soares is the Editor-in-Chief for the Canadian Journal of Chemical Engineering, a Member of the Executive Advisory Board of Wiley-VCH Macromolecular Journals and responsible for Macromolecular Reaction Engineering, and Associate Editor of the Brazilian Journal of Chemical Engineering.

Prof. Duhamel organized and chaired an MSED symposium at the 2010 CSC conference in Toronto. Symposium title: "A Symposium in Honor of Prof. M. A. Winnik" crowning 40 years of research in Polymer Science carried out by Prof. M. A. Winnik at the University of Toronto.

Prof. Penlidis is Editorial Board Member: J. Macromol. Sci.-Pure and Appl. Chem.; Polymer-Plastics Techn. and Eng.; Macromol. React. Eng. J.

Prof. Soares organized the 5th Polymer Reaction Engineering: An Industrial Short Course on Olefin Polymerization Processes. Houston, TX, USA, April 12-16, 2010 (with L. Simon and T. McKenna).

Prof. Soares organized the in-house short course Mathematical modeling of propylene/ethylene/1-olefin terpolymerization. SCG, Rayong, Thailand, August 2, 2010.

Prof. Soares lectured in the Short Course on Polyolefin Characterization Techniques. Shanghai, China, November 6, 2010.

Prof. Soares was a co-organizer in the 3rd International Conference on Polyolefin Characterization, Shanghai, China, November 7-9, 2010.

A fruitful collaboration between Chemical Eng. (Prof. Penlidis) and Civil Eng. (Prof. Marianna Polak) in structural characteristics of pipes (relating micro-structural properties to macro-mechanical properties and modeling of damage mechanics) has led to the formation of the "Creeps" group, with regular meetings and research interactions, including industrial collaborators like Imperial Oil, Canada.

Prof. Feng is Editorial Board Member of the Journal of Membrane Science.

Prof. Vivaldo-Lima continues as President of the Chemical Engineering Academic Subcommittee (SACC-IQ) of UNAM's Engineering Graduate Program.

Prof. Vivaldo-Lima continues as Member for UNAM in the Scientific Committee, and technical coordinator for the UNAM team, in Project "BABETHANOL", funded by the European Community's Seventh Framework Program (FP7/2007-2013) under grant agreement n° 227498.

Prof. Vivaldo-Lima was promoted to "Titular C" Professor, the highest rank at UNAM. He also has the highest rank in UNAM's program for recognition of academic performance (PRIDE).

Prof. Penlidis was the editor of Macromol. Symp., Volume 289, based on the PRE 7 conference topics, with 18 representative papers and 164 pages.

IPR is again heavily involved in the organization of Polymer Reaction Engineering (PRE 8) Conference, May 2012, Cancun, Mexico, via its academic member Prof. Eduardo Vivaldo-Lima and the IPR alumnus, Prof. Marc Dubé, now at the University of Ottawa.

Something very important in the education and training of students, and usually something unappreciated and implicit, is the training of undergraduate students in the area of polymers. IPR members also put a tremendous effort in this area, via undergraduate research assistant or co-operative or senior design projects. A typical estimate might be close to the training of another 50-60 undergraduate students per year!

Prof. Penlidis was the overall judge coordinator for the annual University of Waterloo Graduate Student Conference, involving more than 300 graduate students, in April 2010.

IPR PhD student Afsaneh Nabifar attended the BASF Summer Course, Ludwigshafen, Germany, in August 2010.

Prof. Penlidis was a symposium/session co-chair, for two half-day sessions, PPS 26 (Polymer Processing Society), July 2010, Banff, Canada.

1. NOTE FROM THE OUTGOING DIRECTOR

As I announced repeatedly in previous years (2008 and 2009), I will be stepping down as Director of IPR in 2010. I have been involved with IPR since 1986, when I joined the University of Waterloo (UW), as IPR Associate Director (1991-1994), IPR Interim Director (1994-1995), and its Director from 1995 till now. Before I proceed with a few administrative items concerning 2010 and the election of a new Director, I would like to provide a brief history of IPR and a few facts about IPR which might be of interest to new readers and a “refresher” to others.

IPR was formed in 1978, as the “copolymer group”, mainly based on the individual efforts of Professors Ken O’Driscoll (Chemical Engineering) and Alf Rudin (Chemistry). As such, it has had the same collaborative research spirit and multidisciplinary nature since its inception. In 1984, IPR was officially recognized by the Senate of UW as an Institute, so probably today IPR is one of the longest-serving Institutes at UW (if not the longest-serving). Given its research, teaching and other activities (detailed in previous newsletters, along with other information, available on the IPR website www.ipruw.com), IPR would certainly qualify also as one of the most active Institutes of UW (if not the most active).

IPR consisted mainly of researchers in Chemical Engineering and Chemistry, their research groups, and industrial member companies. Research and development interests spanned almost anything in polymer science, polymer engineering and polymeric materials, ranging from monomer/polymer synthesis, polymer production technology, polymer property characterization (physico-chemical to mechanical characteristics), and polymer processing and reactive modification of polymers. The academic members of IPR have risen from seven in 1986 to 13 today, and span three departments (Chemistry, Chemical Engineering and Mechanical Engineering), two faculties (Engineering and Science), two Universities in Canada (Waterloo and Ryerson) and two countries (Canada and Mexico). Of course, with the multiplicative factor of research collaborations and other interactions of its academic members, the overall IPR network is very extensive. The current IPR academic member list can be found later in the Newsletter. The Senate Research Council (of the Senate) of UW reviews all UW Senate-approved institutes every five years (a practice that started more formally in the 90s). IPR was last reviewed in October 2005 and received approval with accolades. The next review will take place in the fall of 2010.

Two additional characteristics of IPR have been impressive over the years. An industrial membership of almost the “who’s who” in polymer science, engineering and technology, averaging about 15 member companies per year with very strong ties with the IPR academic members (the current IPR industrial member list can be found later in this Newsletter in Appendix 4). What is noteworthy is that some of these companies have been interacting with IPR from the very beginning. At the same time, IPR interacts with many other companies, not necessarily official IPR industrial members, so again the network is very extensive.

The other impressive characteristic of IPR is the number of MSc and PhD students trained (i.e., the training of highly qualified personnel), along with post-doctoral fellows, research engineers and other associates. On average, there are about 50-60 active students per year, representing a considerable percentage of the research work and output of the departments of

Chemical Engineering and Chemistry (20-40%). All these students and researchers, and industrial member representatives, join the IPR academic members on an annual basis (usually in May of every year) for an exchange of scientific information on the latest developments and state-of-the-art in the polymer world. The IPR May Conference has become widely known all over the world (more information can be found in this and previous Newsletters). On May 10, 2011, IPR will hold its 33rd annual Symposium, while it celebrated its “Silver Anniversary” (25 years) of official Institute status in 2009!

A few more “info-bits” about IPR’s trajectory at UW follow:

(a) IPR’s first director was Professor Ken O’Driscoll (Chemical Engineering) from IPR’s inception till 1988). The second director was Professor Alf Rudin (Chemistry), from 1988 – 1994. The third director was Professor Alex Penlidis (Chemical Engineering) from 1994 till 2010.

(b) From its inception, IPR’s mandate has been, and continues to be, the facilitation and “seeding” of interactions between its academic members/students and polymer industry. The mandate is not to fund research or duplicate other services provided by the University. After an interaction is initiated, then the IPR academic member(s), along with the industrial partner, may proceed towards a research agreement (or research contract, under the auspices of the Office of Research of UW). IPR’s achievements speak for themselves (see this and previous Newsletters). These achievements were attained by keeping a tightly focussed core group of academics with common interests in polymerization/polymeric materials, by taking direct action, and by having no bureaucracy (no multiple layers of administration or managing directors, or executive directors, etc.). Let’s emphasize once more that IPR’s Director receives no teaching relief and no stipend (which may be news to other members of the UW community!).

(c) The interested reader can peruse previous Newsletters (available on IPR’s website) for more information on IPR’s extensive contributions to science and engineering, in general, and, more particularly, to the Departments, Faculties and University community, along with more information on “metrics” about its activities and output.

(d) Some benefits of industrial membership in IPR include:

- three days of consulting per year by any IPR faculty members whose research interests are listed on our website, www.ipruw.com
- preprints of research publications well before they appear in the open literature
- attendance at IPR annual symposium
- reduced rates at potential “in-house” courses for company employees’ continuing education/update.
- reduced rates at annual industrial short courses for member companies
- preferential consideration in undertaking contract research and other interactions
- analytical services at reduced cost (no routine analysis)
- reduced rates on specialized lab equipment (no routine use)
- Membership on Industrial Advisory Board

(e) An overview of IPR and more details about research interests of its academic faculty members and its experimental facilities can be found either in previous IPR Newsletters (accessible via the website) or directly via the websites of the individual faculty members.

I would be remiss at this point if I did not make special mention of another important contributor to IPR's well-being. All IPR members (and students), past and current, and I, would like to thank the IPR Administrative Coordinator, Rosemary Anderson, for continuous (since the day I have joined IPR!), unremitting and exemplary service. Rosemary's contributions to the IPR "day-to-day life" have simply been . . . outstanding!

I conclude 16 years as IPR Director with mixed feelings, as is usually the case, but I am a strong believer that in all aspects of life (and especially in academic life) people must be able to "let go". It has been a highly satisfying and enjoyable tenure!

A. Penlidis

INSTITUTE FOR POLYMER RESEARCH (IPR)
CELEBRATING 26 YEARS OF OFFICIAL INSTITUTE STATUS
THIRTY-SECOND ANNUAL SYMPOSIUM
ON POLYMER SCIENCE/ENGINEERING
2010

Conrad Grebel College
Great Hall
University of Waterloo, Waterloo, Ontario
Tuesday, May 11, 2010

8:30	a.m.	Coffee
8:50		Welcome and Opening Remarks
9:00 - 9:30		Afsaneh Nabifar, Chemical Engineering, Waterloo Steps for implementing a Bayesian design framework: complex polymerizations (Winner of 2009 IPR Award for Academic Excellence in Polymer Science/Engineering)
9:30 - 10:30		Professor Aiping Yu, Chemical Engineering (Nanotechnology), Waterloo Carbon nanotubes and graphene nanoplatelets for multi-functional composites
10:30 - 11:00		Coffee
11:00 - 11:30		Hummara Aslam, Chemistry, Waterloo Probing the long-range chain dynamics of a polypeptide in aqueous solution by fluorescence
11:30 - 12:00	p.m.	Yiyoung Choi, Chemical Engineering, Waterloo Preparation of polyethylene/montmorillonite nanocomposites through in situ polymerization using a montmorillonite-supported nickel diimine catalyst (Winner of 2009 IPR Award for Academic Excellence in Polymer Science/Engineering)
12:15 - 1:00		Lunch
1:00 - 1:30		Dr. Jennifer Du, Chemical Engineering, Waterloo Preparation and application of interfacially formed membranes
1:30 - 2:00		Dr. Odilia Perez, Chemical Engineering, Waterloo Homogeneous ethylene polymerization using zirconocene aluminohydride complexes
2:00 - 2:30		Yulin Wang, Chemistry, Waterloo Synthesis and characterization of modified polyisobutylene succinimide dispersants

2:30 - 3:00	Neha Dhar, Chemical Engineering, Waterloo Novel cellulose nanoparticles for potential pharmaceutical and personal care applications
3:00 - 3:30	Coffee
3:30 - 4:00	Christine Keyes-Baig, Chemistry, Waterloo Studying the interactions of a Gemini surfactant with DNA by fluorescence
4:00 - 4:30	Mohammad Meysami, Chemical Engineering, Waterloo Incorporation of devulcanized rubber in a virgin tire rubber compound
4:30 - 5:00	Yan Wu, Chemical Engineering, Waterloo Preparation of polydimethylsiloxane modified polypropylene by olefin cross metathesis reactions
5:00	Closing remarks
6:00 - 7:30	IPR Industrial Member DINNER University Club, Main Dining Room
7:30 - 9:00	Poster Presentations and Informal Get-together University Club, Main Dining Room (IPR graduate students/researchers and symposium participants)

POSTER SESSION
TUESDAY, May 11, 2010, 7:30 pm, UNIVERSITY CLUB

Neha Dhar & Baoliang Peng Chem Eng, Waterloo	Development of Nano Crystalline Cellulose for Personal Home Care Applications
Hadi Izadi Chem Eng, Waterloo	Development of biomimetic polymer structures at small scales for responsible and adaptable adhesion applications
Niousha Kazemi Chem Eng, Waterloo	Reactivity ratio estimation in terpolymerizations with and without an Azeotrope
Salim Khouri Chem Eng, Waterloo	Design, synthesis and characterization of cyclodextrin based pH-responsive polymeric systems
Angela Leung Chem Eng, Waterloo	Novel pH-responsive hybrid peptide block copolymers for intracellular delivery applications
Dr. Firmin Moingeon Chemistry, Waterloo	Arborescent poly(ϵ -caprolactone) copolymers: Synthesis and characterization
Olivier Nguon Chemistry, Waterloo	Chain dynamics of Ru(II)-labeled polystyrene
Odilia Perez Chem Eng, Waterloo	Influence of the supporting conditions on the performance of zirconocene aluminohydrides
Sara Rahmani Chem Eng, Waterloo	Synthesis and characterization of pH-responsive polyampholyte nanogels
Greg Whitton Chemistry, Waterloo	Arborescent polypeptides for controlled drug delivery applications
Matt Wurtele Chem Eng, Waterloo	The evaluation of numerical models for spiral die simulations
Zhaoling Yao Chem Eng, Waterloo	Targeted drug delivery using stimuli-responsive fullerene polymeric systems
Fanny Yuen Chem Eng, Waterloo	Cyclodextrin assisted assembly of stimuli-responsive polymers in aqueous media

**THIRTY-SECOND ANNUAL SYMPOSIUM
ON POLYMER SCIENCE/ENGINEERING
May 11, 2010--CONRAD GREBEL COLLEGE
LIST OF PARTICIPANTS**

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**THIRTY-SECOND ANNUAL SYMPOSIUM
ON POLYMER SCIENCE/ENGINEERING
May 11, 2010--CONRAD GREBEL COLLEGE
LIST OF ORAL AND POSTER PRESENTERS**

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2010

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PREPRINTS 2010

- 10/001 **Optimal Bayesian design of experiments applied to nitroxide-Mediated radical polymerization**
A. Nabifar, N.T. McManus, E. Vivaldo-Lima, P.M. Reilly and A. Penlidis
Macromol. React. Eng., Acc., 01/10
- 10/002 **Kinetic aspects of styrene polymerization with an acyloxyamine**
A. Nabifar, N.T. McManus, E. Vivaldo-Lima and A. Penlidis
J. Macromol. Sci., Pure and Appl. Chem., Acc., 02/10
- 10/003 **Returning to basics: Direct integration of the full molecular-weight distribution equations in addition polymerization**
E. Saldivar-Guerra, R. Infante-Martinez, E. Vivaldo-Lima, A. Flores-Tlacuahuac
Macromol. Theory Simul., Acc., 02/10
- 10/004 **Mathematical modeling of acrylonitrile-butadiene emulsion copolymerization: Model development and validation**
I.D. Washington, T.A. Duever and A. Penlidis
J. Macromol.Sci., Pure and Appl. Chem., Acc., 03/10
- 10/005 **A UV-initiated reactive extrusion process for production of controlled-rheology polypropylene**
G. He and C. Tzoganakis
Polym. Eng. And Sci., Acc., 03/10
- 10/006 **Dynamics and rheology of colloidal star polymers**
B.M. Erwin, M. Cloitre, M. Gauthier and D. Vlassopoulos
Soft Matter, Acc., 03/10
- 10/007 **Arborescent polymers with a mesoscopic scale**
T. Aridi and M. Gauthier
Book Chapter in Complex Macromolecular Architectures: Synthesis, Characterization and Self-Assembly, edited by N., Hadjichristidis, Y. Tezuka and A Hirao, Wiley, 2010
- 10/008 **Synthesis of I,4-Polybutadiene dendrimer-arborescent polymer hybrids**
M. Gauthier and A. Munam
Macromoleclues, Acc., 03/10
- 10/009 **Effect of initiator type and concentration on polymerization rate and molecular weight in the bimolecular nitroxide-mediated radical polymerization of styrene**
T.R. Nogueira, M.C. Goncalves, L.M.F. Lona, E. Vivaldo-Lima, N. McManus and A. Penlidis
Adv. in Polym. Tech., Acc., 01/10

- 10/010 **Scaling-up a reactive extrusion operation: a one-dimensional simulation analysis**
E. Ortiz-Rodriguez and C. Tzoganakis
Intern'l Polym. Processing, Acc., 03/10
- 10/011 **Fluorine-containing arborescent polystyrene-graft-polyisoprene copolymers as polymer processing additives**
M. Gauthier, W-Y Lin, S.J. Teertstra, C. Tzoganakis
Polymer, Acc., 04/10
- 10/012 **Nanodomain formation in lipid membranes probed by time-resolved fluorescence**
H. Siu, J. Duhamel
Langmuir, Acc., 05/10
- 10/013 **Fluorescence studies of a series of monodisperse telechelic α , ω -dipyrenyl-poly(*N*-isopropylacrylamide)s in ethanol and in water**
J. Yip, J. Duhamel, X. Ping Qiu, F. Winnik
Can. J. Chem, Acc., 07/10
- 10/014 **A study of the dynamics of the branch ends of a series of pyrene-labeled dendrimers based on pyrene excimer formation**
J. Yip, J. Duhamel, G.J. Bahun, A. Adronov
J. Phys. Chem. B, Acc., 07/10
- 10/015 **Lipase-catalyzed syntheses of linear and hyperbranched polyesters using compressed fluids as solvent media**
A. Lopez-Luna, J.L. Gallegos, M. Gimeno, E. Vivaldo-Lima, E. Barzana
J. Mol. Catalysis. B, Enzymatic, Acc., 08/10
- 10/016 **An alternative approach to estimating parameters in creep models of high density polyethylene**
J.J. Cheng, M.A. Polak and A. Penlidis
Polym. Eng. Sci., Acc., 08/10
- 10/017 **Simulation of polymerization kinetics and molecular weight development in the microwave-activated emulsion polymerizations of styrene using EMULPOLY**
G. Jaramillo-Soto, M. Ramirez-Cupido, J.A. Tenorio-Lopez, E. Vivaldo-Lima and A. Penlidis
Chem. Eng. & Techn., Acc., 09/10
- 10/018 **Copolymerization kinetics of styrene and divinylbenzene in the presence of *S*-thiobenzoyl thioglycolic acid as RAFT agent**
M. Roa-Luna, G. Jaramillo-Soto, P. V. Castaneda-Flores and E. Vivaldo-Lima
Chem. Eng. & Techn., Acc., 09/10

- 10/019 **Investigations on Azeotropy in multicomponent polymerizations**
N. Kazemi, T.A. Duever and A. Penlidis
Chem. Eng. And Techn., Acc., 07/10
- 10/020 **A sequential iterative scheme for design of experiments in complex polymerization**
A. Nabifar, N.T. McManus, E. Vivaldo-Lima, A. Penlidis
Chem. Eng. And Techn., Acc., 08/10
- 10/021 **Diagnostic checks and measures of information in the Bayesian design of experiments with complex polymerizations**
A. Nabifar, N.T. McManus, E. Vivaldo-Lima, A. Penlidis
Macromol. Symp., Acc., 09/10
- 10/022 **An alternative approach to estimating parameters in creep models of high density polyethylene**
J.J. Cheng, M.A. Polak, A. Penlidis
Polym. Eng. Sci., Acc., 08/10
- 10/023 **Constitutive modeling of damage evolution in semicrystalline polyethylene**
J.A. Alvarado-Contreras, M.A. Polak, A. Penlidis
J. Eng. Mat. Tech., Acc., 08/10

Research Personnel

(SUPERVISOR)

NAME	CAT	DEPT	TD	JD	RD	XF	MG	NMc	AP	JS	MT	CT	THESIS/PROJECT TOPIC	COMPL. DATE
N. Abedin	1	ChE										X	Polymer micronization with supercritical CO ₂	Sep 11
P. Akhlaghi	2	ChE									X		Cosmetic delivery systems using nanocrystalline cellulose	Apr 14
S. Al-Adwani	2	ChE								X			Modelling of catalytic converters	Dec 12
A. Al-Khazal	1	ChE								X			Crystallization elution fractionation of polyolefins	Sep 12
M. Al-Saleh	2	ChE	X							X			Parameter estimation of Ziegler-Natta catalysts using molecular weight and comonomer sequence distribution	Apr 11
A. Al-Shaiban	2	ChE								X			Effect of electron donors on propylene polymerization with Ziegler-Natta catalysts	Sep 12
A. Alghyamah	2	ChE								X			Mathematical modelling of polymerization with Ziegler-Natta catalysts	Sep 11
S. Aliakbari	2	Chem					X						Thermal interface materials	Aug 11
A. Alturk	1	Chem					X						Arborescent polybutadienes	Dec 11
Y. Alzahrany	1	Chem					X						Amphiphilic arborescent copolymers	May 12
Y. Amintowlieh	2	ChE							X			X	UV crosslinking of polyethylene	Sep 14
A. Araya	1	Chem		X									Characterization of a modified polyolefin used as oil-additive	Sep 11
T. Aridi	2	Chem					X						New grafting techniques	Dec 11
A.Y. Ashiri	4	ChE								X			Intraparticle mass transfer resistances in ethylene polymerization with heterogeneous Ziegler-Natta catalysts	Apr 11
H. Aslam	1	Chem		X									Chain dynamics of ruthenium-labeled polylysine probed by fluorescence	Sep 11
D. Bacinello	2	ChE									X		Development of block copolypeptide systems for drug delivery applications	Jun 12
Y. Behjat	1	ChE							X				Tensile properties of pipes (with M. Polak (Civ. Eng.))	May 10
M. Bin-Shams	2	ChE	X										Observability and economic aspects of fault detection and diagnosis using CUSUM-based multivariate statistics (with H. Budman, Chem. Eng., lecturer, University of Bahrain)	Aug 10
M. Bulsari	4	ChE							X			X	Polymer micronization/Ultrasonic properties of polymers	Dec 11
S. Chen	2	Chem		X									Characterization of solutions of pyrene end-labelled poly(ethylene oxide) by fluorescence and Rheology	Jun 12
Y. Choi	2	ChE								X			Synthesis of functional polyolefins	Sep 11

1 = MASc 2 = PhD 3 = Postdoctoral Fellow 4 = Res. Associate 5 = Technician

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NAME	CAT	DEPT	TD	JD	RD	XF	MG	NMc	AP	JS	MT	CT	THESIS/PROJECT TOPIC	COMPL. DATE
N. Chokputtana wuttlerd	4	ChE								X			Modeling of crystallization elution fractionation	Jan 12
N. Dhar	1	ChE									X		Vibrating sample magnetometer for the characterization of novel magnetic nanomaterials	Apr 10
J. Dockendorff	2	Chem					X						Metal-loaded micelles	May 11
D. Dorschner	1	ChE	X						X				Modelling multicomponent polymerization	Sep 10
J. Du	4	ChE				X							Aroma extraction from coffee	May 11
F. Dubbut	4	ChE								X			Modelling of an industrial polymerization process for the production of impact polypropylene copolymers	Nov 10
S. Eslami	2	ChE				X							Membrane reactors	Dec 13
M. Farooq	2	ChE				X							Waste water treatment by membrane/adsorption	Aug 12
M. Fowler	2	Chem		X									Characterization of the properties of polypeptide aggregates	Dec 12
D. Francisco	4	ChE				X							Coffee aroma enrichment	Mar 11
T. Hall	1	Chem		X			X						Long range chain dynamics of poly(glutamic acid)	Dec 11
M. Haque	1	ChE						X	X				Water-soluble polymers based on acrylamide	May 10
Y. Hu	2	ChE				X							Facilitated transport membranes	Aug 13
H. Izadi	2	ChE						X	X				Polymers with tailor-made adhesive properties at nano-scale (with B. Zhao)	Sep 13
S. Joorabchian	1	CivE			X								Polymer modified concrete	Aug 10
J. Juger	3	Chem					X						Butyl rubber ionomers	May 11
N. Kazemi	2	ChE							X				Parameter estimation in terpolymerization	May 14
C. Keyes-Baig	2	Chem		X									Electron transfer in DNA: A fluorescence blob model approach	Dec 11
M. Khosa	3	ChE				X							Ultrafiltration	Oct 10
S. Khouri	1	ChE									X		Experimental characterisation of pH responsive cyclodextrin/polymeric complexes and theoretical calculation cellulose microcrystallites dimensions	Apr 10
P. Kundu	2	ChE				X							CO ₂ capture from flue gas for greenhouse gas emission control	Aug 12
C. Legros	2										X		Biodegradable and biocompatible nanogels for drug delivery applications	Oct 14
A. Leung	1	ChE									X		Novel pH-responsive hybrid peptide block copolymers for intracellular delivery applications	Aug 10
J. Li	3	ChE				X							Wastewater treatment by membranes	Aug 10

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NAME	CAT	DEPT	TD	JD	RD	XF	MG	NMc	AP	JS	MT	CT	THESIS/PROJECT TOPIC	COMPL. DATE
I. Maafa	2	ChE								X			Reactivity ratio estimation for the copolymerization of ethylene and propylene with heterogeneous Ziegler-Natta catalysts	Dec 15
C. Madhuranthakam	4	ChE							X				Nitrile rubber continuous trains: modelling and optimization	May 12
A. Maneshi	2	ChE								X			Synthesis and mathematical modelling of clay/polyolefin nanocomposites	Aug 10
S. Masoumi	2	ChE	X										Model discrimination using MCMC methods	Aug 12
B. Matti	1	ChE			X								Optimization of a living polymerization system	Aug 10
J. McCoy	4	ChE								X			Kinetics of ethylene/1-butene copolymerization with heterogeneous Ziegler-Natta catalysts	Apr 11
S. Mehdiabadi	2	ChE								X			Synthesis and modelling of branched polyolefins with complex structures	Apr 11
M. Meysami	2	ChE										X	Devulcanization of tire rubber crumb with supercritical CO ₂	Sep 11
F. Moingeon	3	Chem					X						Photocatalysts for H ₂ production	May 11
P. Mutyala	2	ChE										X	Production of TPVs from devulcanized rubber crumb	Dec 12
A. Nabifar	2	ChE						X	X				Bayesian design of experiments in emulsion and controlled radical polymerization	Sep 12
L.Y. Nan	2	ChE									X		Nanoparticle synthesis using polyacrylic acids	Apr 14
M. Narkchamnan	4	ChE								X			Crystaf fractionation of polyolefins: Cocrystallization effects	Jan 11
O. Nguon	2	Chem					X						Polymer chain dynamics	Dec 11
N. Omidbakhsh	2 PT	ChE	X										Computer aided product design and development for peroxide based disinfectants (with A. Elkamel (Chem. Eng.) and P. Reilly, Vice-President Research, Virox Technologies, Oakville, ON)	May 10
O. Perez	4	ChE								X			Polyethylene production with novel bimetallic metallocene catalysts	Sep 10
B.L. Peng	2	ChE									X		Interactions between functionalized biocompatible polymer systems and surfactants	Sep 14
Sahar Rahmani	1	ChE									X		Magnetic nanoparticles for the removal of organic contaminants in water system	May 11
Sara Rahmani	1	ChE									X		Coated nanogels for the delivery of insulin	May 11
M. Reza	2	ChE				X							Membrane bioreactor for wastewater treatment	Aug 14
A. Salam	3	ChE				X							Sericin-based functional materials	May 10
A. Sardashti	2	ChE							X			X	Property modifications of HDPE	Sep 14
Y. Shangquan	1	ChE				X							Highly permeable membranes	Apr 11
S.-Y. A. Shin	3	ChE								X			In-situ preparation of clay-thermpolastic nanocomposites	Jun 10

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E. Siritwongsarn	4	ChE								X			Modeling of temperature rising elution fractionation	Sep 11
H. Siu	2	Chem		X									Fluorescence and rheological studies of surfactant-associative polymers associations	Jun 10
K. Stewart	1	ChE						X	X				Polymeric sensors for detection of toxic vapours	Sep 11
D. Suh	1	ChE									X		Virial capsid nanoparticles for drug delivery applications (with M. Aucoin)	Sep 10
J. Sun	2	ChE				X							Polyelectrolyte membranes	Aug 14
K. Suriya	4	ChE								X			Crystaf fractionation of polyolefins: Molecular weight effects	Dec 10
C. Ulloa	1	ChE				X							Hollow fiber membranes	Aug 11
L. Wadden	1	CivE							X				Creep performance of pipes (with Polak, Civ Eng)	Sep 11
Y. Wang	1	Chem		X									Correlation between the binding and associative strength of modified PIBSA-based dispersants	Aug 10
M. Wurtele	1	ChE										X	Numerical simulations of polymer extrusion	Dec 11
G. Whitton	2	Chem					X						Arborescent polymers form amino acids	Aug 11
Y.R. Wu	1	ChE						X				X	Polypropylene modified by polydimethylsiloxane in catalytic cross metathesis reactions	May 10
R. Yeetsorn	2	ChE										X	Development of electrically conductive thermoplastic composites for bipolar plate application in polymer electrolyte membrane fuel cell (with Michael Fowler, Chem. Eng.)	May 10
J. Yip	1	Chem		X									Study of the aggregation in water of pyrene end-labeled poly(N-isopropylacrylamide)	Sep 10
F. Yuen	1	ChE									X		Cyclodextrin assisted self-assembly of stimuli-sensitive block copolymers in aqueous media	Sep 10
A. Yeung	1	ChE									X		Novel pH-responsive hybrid peptide block copolymers for intracellular delivery applications	Dec 10
M. Zaman	4										X		Cationic modification of nanocrystalline cellulose	Jan 12
Y. Zhang	2	ChE				X							Solvent dehydration by pervaporation	Apr 13
Y. Zhaoling	2	ChE									X		Water-soluble fullerene polymers for drug delivery applications	Jun 12
S. Zhu	4	ChE							X			X	Ultrasonic characterization of rubber materials	Sep 11

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