

MONTREAL, CANADA
OCTOBER 15TH - 18TH 2000

Chemical Engineering
for the New Millenium

2000

Le génie chimique
pour le nouveau millénaire



This 50th CSChE Conference, 15-18 October in Montreal, marked a half-century of continuing success for one of the proudest traditions of the Canadian Society of Chemical Engineering: providing chemical engineers with an opportunity to learn about the latest research and technology and to renew acquaintances. This year's Conference also marked the debut of symposia sponsored by the North American Alliance of Chemical Engineers, a new alliance of chemical engineering societies in Canada, Mexico and the United States. The CSChE is dedicated to life-long learning in support of excellence in chemical engineering. This Conference has been an incredible opportunity because it has offered many chances to learn in the short span of three days, in addition to the chance to visit beautiful Montreal. The Conference theme was "Chemical Engineering for the new Millennium". The Conference registered over 1200 participants and hosted this year five symposia: Chemical Reactor Engineering, Pharmaceuticals and Tissue Engineering, Plasma Technology, Applications in the Chemical Process Industries, Process Integration and Rheology.

A symposium on rheology organized by the Canadian Rheology Group and the Groupe Français de Rhéologie This symposium included sessions on fundamental and applied rheology, polymer solutions, polymer blends and composites, emulsions, suspensions, instrumentation and numerical simulations. As we were in Montréal, presentations were given in English and in French.

Rheology Session

M. R. Kamal opened the first session with a keynote lecture on "Rheology and other issues in polymer processing" followed by "Predicting the processability of long-chain branched metallocene polyethylenes" (J. Dealy, P. Wood-Adams & J. Soares) presented by J. Dealy. G. Marin described "L'Utilisation des modèles de dynamique moléculaire pour déterminer la distribution des masses molaires de polymères linéaires à partir de leurs propriétés viscoélastiques" (F. Léonardi, A. Allal & G. Marin). Y. Fang investigated "Rheological effects in film blowing" (P. J. Carreau, Y. Fang & P. G. Lafleur) and "Proper-

ties of polyethylene foams" (Z. Zhang, A. Ait-Kadi & D. Rodrigue) were described by D. Rodrigue, while M. Grmela presented the "Case II diffusion in glassy polymers" (A. El Afif & M. Grmela).

Multiphase Polymer Systems: Polymer Blends

P. J. Carreau, keynote lecturer, reviewed basic concepts, molecular aspects and mechanisms, which control the rheological properties of multiphase polymer systems. Rheometry was shown to be a very powerful tool for characterising polymers, mainly in non-linear viscoelastic domains. This was illustrated using specific examples for blends of immiscible polymers and suspensions of fibres and particles in polymer melts. Coupling effects between rheological properties and morphological changes for immiscible polymer blends and fibre orientation in polymer suspensions during processing were discussed in light of available theories and governing equations. Finally, directions for future research and challenges for experimental as well as for theoretical developments were stressed introducing the other works presented in this session: "Effect of maleic anhydride and styrene-butadiene rubber content on the rheology and phase behavior of poly(styrene-co-maleic anhydride)/poly(methyl methacrylate) blends" (D. Chopra, M. Kontopoulou, D. Vlassopoulos & S. G. Hatzikiriakos), "Diffusion and chemical reaction at polymer/polymer interfaces" (H. Qiu & M. Bousmina), "Influence of molecular structure and blend composition on the rheology and morphology of PP/LLDPE blends" (P. Singh & C. T. Bellehumeur), "Rheological data from dynamic mechanical thermal analysis of multiphase polymers" (C. E. Chaffey), "Investigation of rheological behaviour of diene-based polymer solutions" (Q. Pan & Garry L. Rempel), "Détermination non invasive de la rhéologie d'un fluide en écoulement par mesure de profils de vitesse" (C. Bachelet, Ph. Dantan & P. Flaud).

Multiphase Polymer Systems: Suspensions

Rheology and processing of short fibres composites, was the theme of the keynote lecture given by F. Chinesta who emphasised on the necessi-

ty to develop mathematical models to simulate the flow during the forming processes as well as specific numerical strategies to solve the resulting coupled (kinematics - fibre orientation) flow model. When the flow model is established and the rheological parameters are identified experimentally, industrial forming processes can be simulated. Numerical predictions were compared with experimental results on 3D injection and extrusion using short fibres reinforced thermoplastics. It could be concluded that the global modelling predicts quite accurately the industrial process. Most of the presentations given in this session were dedicated to industrial applications. "Experimental study and model predictions of rheological behavior of fibre suspensions in viscoelastic media" (A. Ramazani, A. Aït-Kadi & M. Grmela), "Étude de quelques propriétés non-linéaires de suspensions concentrées de kaolin" (M. Moan, T. Aubry & F. Bossard), "Characterizing the rheology of aqueous goethite slurries" (D. F. James, B. D. Blakey & M. Kawaji), "The rheology of clay dispersions" (K. Bekkour & N. Kherfelah), "Comportement rhéologique du polypropylène fondu chargé de fibres de verre" (M. Sepehr, P. J. Carreau & G. Aussias).

Rheometry, Industry and Process

L. Choplin gave the keynote lecture on Cosmetic products and rheology (L. Choplin & J. F. Tranchant) followed by "Caractérisation en cisaillement et/ou élongation des écoulements de polymère" (G. Chaidron & F. Chinesta), "RheoWave 1 - Unmatched potential for measurements on thin viscoelastic fluids" (H. Hilbig), "Effect of the elasticity of polymer solutions on the power drawn by a rusthon turbine" (I. Seyssiecq, H. Desplanches, Y. Gaston-Bonhomme & J. L. Chevalier), "Dispersion visualization under high shear rate in a transparent Couette flow cell" (F. Mighri & M. A. Huneault), "The rheological investigation of bitumen with different measuring procedures" (A. Zupan & M. Zumer), "Comportement rhéologique d'émulsions concentrées huile dans eau: effet de la concentration en émulsifiant" (I. Talbi-Boucenna, L. Royon & S. Abdobal), "Dispersion of polymers in bitumen: effect of polymer melt flow index" (A. A. Yousefi).

Numerical Simulations

"Nonlinear viscous fingering of non-Newtonian fluids in a rectilinear Hele-Shaw cell" (B. Singh & J. Azaiez), "Viscoelastic contraction flows: comparison of axisymmetric and planar configurations" (S. Nigen & K. Walters), "Rhéologie numérique pour les suspensions de fibres courtes à l'état fondu" (F. Chinesta), "Fluides viscoélastiques: modélisation numérique et mesures expérimentales" (M. C. Heuzey, A. Fortin & J. M. Dealy), "Linear stability analysis of miscible displacement in porous media involving shear thinning fluids" (B. Singh & J. Azaiez), "A method for calculation of final film thickness in free coating of viscoelastic fluids onto a vertical surface" (S. Savarmand, S. Azizmohammadi, A. Bahrami & M. R. Golkar-Narenji).

Attendance to the presentations was exceptionally high. Very stimulating discussions took place during the presentations. The meeting with chemical engineers allowed to share ideas and discuss topics that will contribute to the advancement of applied rheology. A warm get-together sponsored by HAAKE and the Canadian Rheology Group allowed additional contacts between the Canadian, the French and all the participants who valued the hospitality of the Montrealers.

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