Foreword: Special issue on papers presented at the de Gennes Discussion Conference, Chamonix, February 1st–5th, 2009

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The French Group of Rheology under the auspices of the European Society of Rheology organized the de Gennes Discussion Conference entitled “From reptation to glassy materials: de Gennes pioneering work in rheology and recent developments.” The organization of this conference strongly involved the French rheological community who wanted to pay tribute to Pierre Gilles de Gennes for the new ideas he brought to this field, especially in polymer science and complex fluids. This conference was held in Chamonix (France), a nice city at the foot of Mont-Blanc, as a reminiscence of the taste of our Nobel Prize winner for mountains.

The format of the meeting was quite unusual, since it was based on invited lectures given by distinguished experts in different fields (polymer melt rheology and dynamics, polymers in solutions, polymers at surfaces and adhesion, and polymers and biology). Participants of the meeting were suggested to give a 4-minute oral presentation of their poster prior to the poster discussion. In addition, three industrial sponsors (Total, Saint-Gobain, and L’Oréal) agreed to give an after-dinner conference, emphasizing the importance of soft matter research in their companies. Besides 20 world renowned invited speakers, 64 participants took part of the meeting, presenting 42 posters. Fifteen countries were represented with large delegations from France, the United States, the United Kingdom, and Japan. The participants were invited to submit papers presented at

this conference for publication in an issue of *Rheologica Acta*, and the result is this collection of papers.

The special issue starts with a review of Ralph Colby on the structure and linear viscoelasticity of neutral and polyelectrolyte solutions. As pointed out by Ralph, the de Gennes contributions in this field were of primary importance, especially the key role of the correlation length in both systems and the reptation dynamics.

The next contribution, also a review paper, reflects the presentation given by Malcolm Mackley who reviewed the stretching of polymer chains from the pioneering work of G.I. Taylor up to the very recent work on polymer melts in extensional flows. de Gennes’ contribution on relaxation times of stretched polymer chains is outlined.

The third contribution of invited speakers comes from Manfred Wagner and is co-authored by Victor Rolon-Garrido. This paper has to be added to the important improvements of the seminal work of de Gennes on reptation, which has been further developed by Doi and Edwards to include non-linear phenomena and many others later. In this paper, the introduction of the intrachain pressure effect is used to model successfully various non-linear shear flow data, with the parameters deduced from linear viscoelasticity.

The next papers were presented as poster contributions at the conference.

In the field of simulation, J.T. Padding et al. presented a contribution to the rheology (both linear and non-linear) of star polymer solutions using a coarse-grained approach where each star macromolecule is represented as a single particle and interactions are taken into account by a convenient potential. S. Nedelcu and J.U. Sommer considered the dynamics of short chains in frozen polymer networks with various

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monomer densities. A Monte Carlo approach is used to show the importance of the topology of the crosslinked networks. The reptation dynamics of free chains is recovered. Grmela et al. considered the modelling of the rheological response of so-called living polymers under flow using various mechanisms including Brownian relaxation, reptation, and scission recombination and were obtained under the S-shaped form of the shear stress versus shear rate curve in particular conditions.

Three experimental contributions were also provided. Riedel et al. investigated, using dielectric measurements, the relaxation of linear cis-1.4 polyisoprene over a broad molecular weight range. From the normal mode dispersion, they were able to identify the crossover associated to the end of the Rouse regime that linked to the pure reptation regime but noticed a discrepancy between the shape of the loss peak and the reptation prediction. Filled polymer melts were investigated by Carrot et al. who paid attention to the secondary plateau occurring at low frequency in sufficiently filled polymer melts. This plateau was accounted for on the basis of Leonov's model of filled polymers. The authors conclude, however, that other dissipative processes that rupture the flocs occur in these systems. The last paper, presented by Bossard et al., is devoted to the behavior of high molecular weight PEO solutions, which undergo, under a stirring chain,

scission and aggregation phenomena. The influence of molecular weight and concentration regime on these phenomena is discussed.

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Jean-François Tassin, Nadia El Kissi, and Philippe Coussot, Chairs