IMCN

Secteur des Sciences
et Technologies

UCLouvain

Invitation à la soutenance publique de thèse de

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Master of science

Pour l'obtention du grade de Docteur en sciences de l'ingénieur et techologie

« Nonlinear shear flow of model entangled polymers: experiments and modeling »

qui se déroulera

le jeudi 30 janvier 2020 à 15h

Auditoire LAVO 51

Place Louis Pasteur, 1

1348 Louvain-la-Neuve

Jury members :

Prof. Evelyne Van Ruymbeke (UCLouvain), supervisor
Prof. Jean-François Gohy (UCLouvain), chairperson
Prof. Roland Keunings (UCLouvain), secretary
Prof. Christian Bailly (UCLouvain)
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Dr. Salvatore Costanzo (Univ. Napoli, Italy)

Understanding and modeling the nonlinear flow properties of entangled polymeric liquids is mandatory for further optimization of industrial processing techniques and applications of such complex fluids. In response to large deformations over a range of timescales, polymer chains exhibit nonlinear viscoelastic properties. Example of such properties include shear thinning and normal stress differences. Despite theoretical and experimental advances in the field, the molecular origin of such properties is not yet fully understood. It is therefore valuable from both a scientific and engineering perspective, to provide further molecular insight enabling us to predict the nonlinear viscoelastic properties of entangled polymers. In this thesis, we investigate both theoretically and experimentally the nonlinear response of linear polymers under shear flow. Their complex nonlinear behavior is difficult to quantify experimentally and is a known challenge for existing molecular constitutive models. The contribution of this thesis is therefore to measure and study systematic sets of entangled polymer systems by precise rheological measurements under startup conditions with the use of the Cone-Partitioned Plate (CPP) geometry. Regarding theoretical efforts, we first examine the accuracy of several existing tube-based constitutive equations by comparing the model predictions against the data produced in this work or available in literature. Based on these results, we then propose a simple approach which allows a quantitative description of the shear viscosity in the steady regime.