Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Surface tension-driven flows induced by polymerization waves[1]
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Thermal frontal polymerization (FP) is a process in which a monomer-initiator mixture is converted into a polymer via a localized reaction zone that propagates due to the interplay between heat diffusion and exothermic polymerization whose reaction rate increases with temperature following Arrhenius' dependence. Recent experiments considering horizontally propagating FP have evidenced the presence of hydrodynamic flows that interfere with the dynamics of polymerization waves and even possibly prevent their initiation. Since those experiments are conducted in systems *open to the air*, *surface tension-driven (or Marangoni) flows*, due to temperature gradients between the cold monomer-initiator mixture and the hot polymer solution, are expected to play an important role in the observed experimental results. In this context, we propose a two-dimensional model that includes the incompressible Navier-Stokes (NS) equations coupled to the reaction-diffusion equations for temperature and for the degree of polymerization. Preliminary numerical results of surface tension-driven flows induced by polymerization waves are discussed. A particular attention is devoted to the remarkable possibility of Marangoni flows to prevent the formation of polymerization waves.

[1]The authors thank the Actions de Recherches Concertees program and the F.R.S.-FNRS for their financial support

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Date submitted: 30 Jul 2019 Electronic form version 1.4