

Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Influence of Heat Transfer on Stability of Newtonian and Non-Newtonian Extending Films ZHEMING ZHENG, OLUS BORATAV, CHUN-FENG ZHOU, Corning Incorporated, CORNING INCORPORATED TEAM — We consider the stability of Newtonian and Non-Newtonian extending films under local or global heating or cooling conditions. We derive the thickness-averaged mass, momentum and energy equations (energy equation including both convective and radiative heat transfer) and analyze the stability using eigenvalue analysis. We show that the influence of heating and cooling on stability strongly depends on the magnitude of the Peclet number. Examples of stabilization or destabilization of heating or cooling are shown for very small and very large Peclet numbers. The impact of three non-Newtonian (viscoelastic) models (Maxwell, PTT and Giesekus) on stability results is also discussed.

Zheming Zheng
Corning Incorporated

Date submitted: 06 Aug 2012

Electronic form version 1.4