

Accepted Manuscript

Ink Transfer of Non-Newtonian Fluids from an Idealized Gravure Cell:
The Effect of Shear and Extensional Deformation

Sunilkumar Khandavalli, Jonathan P. Rothstein

PII: S0377-0257(17)30086-1
DOI: [10.1016/j.jnnfm.2017.02.005](https://doi.org/10.1016/j.jnnfm.2017.02.005)
Reference: JNNFM 3871



To appear in: *Journal of Non-Newtonian Fluid Mechanics*

Received date: 17 August 2016
Revised date: 23 December 2016
Accepted date: 17 February 2017

Please cite this article as: Sunilkumar Khandavalli, Jonathan P. Rothstein, Ink Transfer of Non-Newtonian Fluids from an Idealized Gravure Cell: The Effect of Shear and Extensional Deformation, *Journal of Non-Newtonian Fluid Mechanics* (2017), doi: [10.1016/j.jnnfm.2017.02.005](https://doi.org/10.1016/j.jnnfm.2017.02.005)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Ink Transfer of Non-Newtonian Fluids from an Idealized Gravure Cell: The Effect of Shear and Extensional Deformation

Sunilkumar Khandavalli, Jonathan P. Rothstein

*Mechanical and Industrial Engineering, University of Massachusetts Amherst, MA 01003
USA*

Abstract

In the presented study, we have investigated the effect of a complex flow field consisting of a combination of both shear and extensional deformation on the liquid transfer from an idealized gravure cell. The study was conducted for two classes of non-Newtonian fluid; a shear and extensional thickening nanoparticle dispersion and a extensional thickening viscoelastic polymer solution with a constant shear viscosity. The shear thickening fluid was a dispersion of fumed silica nanoparticles in polypropylene glycol and the viscoelastic fluid was a solution of polyethylene oxide (PEO) in water. The idealized gravure printing experiments were conducted using a combination of linear servo motor used to impose an extensional flow and a rotational servo motor to impose a shear flow during pickout. The fluid pickout from the gravure cell was studied as a function of the magnitude of the extensional and shear deformation rates. The fluid filament interface profile evolution during the pickout process was examined using a high speed camera. For the shear thickening fluid, the pickout resulting from a pure extensional flow field was found to be enhanced compared to Newto-

Email address: rothstein@ecs.umass.edu (Jonathan P. Rothstein)

Download English Version:

<https://daneshyari.com/en/article/4995573>

Download Persian Version:

<https://daneshyari.com/article/4995573>

[Daneshyari.com](https://daneshyari.com)