

# Accepted Manuscript

Evaluation of principal residual stress and its relationship with crystal orientation and mechanical properties of polypropylene films

Ying Shi, Cui Zheng, Minqiao Ren, Yujing Tang, Li-Zhi Liu, Bob He



PII: S0032-3861(17)30665-1

DOI: [10.1016/j.polymer.2017.07.006](https://doi.org/10.1016/j.polymer.2017.07.006)

Reference: JPOL 19818

To appear in: *Polymer*

Received Date: 14 March 2017

Revised Date: 10 June 2017

Accepted Date: 1 July 2017

Please cite this article as: Shi Y, Zheng C, Ren M, Tang Y, Liu L-Z, He B, Evaluation of principal residual stress and its relationship with crystal orientation and mechanical properties of polypropylene films, *Polymer* (2017), doi: [10.1016/j.polymer.2017.07.006](https://doi.org/10.1016/j.polymer.2017.07.006).

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.

# Evaluation of Principal Residual Stress and its Relationship with Crystal Orientation and Mechanical Properties of Polypropylene Films

Ying Shi, Cui Zheng, Minqiao Ren, Yujing Tang, Li-Zhi Liu<sup>\*,1</sup>, Bob He<sup>2</sup>

<sup>1</sup> Sinopec Beijing Research Institute of Chemical Industry, Beijing, 100013, People's Republic of China

<sup>2</sup> Bruker AXS Inc. 5465 East Cheryl Parkway, Madison, WI 53711, USA

\* Email: liulz.bjhy@sinopec.com

## Abstract

Evaluation of principal residual stress with X-Ray diffraction for metals has been widely practiced, but not for polymers due to a large fraction of amorphous phase, though it is very important for many engineering applications. Such a method is established for rigid semicrystalline polymer with rubber amorphous which, in the present work, are defined as the polymers with an amorphous rubber phase and a crystal matrix (rigid crystal network) providing its plastic modulus. An equal strain model between crystal and amorphous phases and the Young's modulus contributed by both crystal and amorphous phases, instead of moduli from crystal region, are justified for the stress evaluation for rigid semicrystalline polymers. The principal residual stresses obtained with our approach show a very good correlation with crystal orientation and the anisotropic mechanical properties of the polymer films studied. The established method can be widely used for rigid semicrystalline polymers with rubbery amorphous.

Download English Version:

<https://daneshyari.com/en/article/5177698>

Download Persian Version:

<https://daneshyari.com/article/5177698>

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