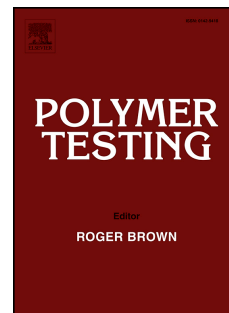


# Accepted Manuscript

Evaluation of effective density of the molecular network and concentration of the stress transmitters in amorphous layers of semicrystalline polyethylene

Zbigniew Bartczak



PII: S0142-9418(18)30419-7

DOI: [10.1016/j.polymertesting.2018.04.027](https://doi.org/10.1016/j.polymertesting.2018.04.027)

Reference: POTE 5432

To appear in: *Polymer Testing*

Received Date: 12 March 2018

Accepted Date: 16 April 2018

Please cite this article as: Z. Bartczak, Evaluation of effective density of the molecular network and concentration of the stress transmitters in amorphous layers of semicrystalline polyethylene, *Polymer Testing* (2018), doi: 10.1016/j.polymertesting.2018.04.027.

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 effective density of the molecular network and concentration of the stress transmitters in amorphous layers of semicrystalline polyethylene

**Zbigniew Bartczak**

*Centre of Molecular and Macromolecular Studies, Polish Academy of Sciences, Sienkiewicza 112, 90-363 Łódź, Poland*

*e-mail: bartczak@cbmm.lodz.pl*

## Summary

A method of evaluation of the molecular network density in semicrystalline polymers and the concentration of stress transmitters, i.e. the molecular elements transferring load between neighboring lamellae, is presented. It is based on measurements of the residual elastic stress left after arresting the strain. The network properties were derived on the ground of rubber elasticity.

This approach was applied to several polyethylenes of different chain length and architecture. The molecular network in these materials was additionally altered by blending with low molecular wax or by annealing. For all samples, the stress transmitter concentration was estimated and compared with theoretical predictions, including the Huang-Brown model for tie molecules. It was found that both molecular weight and chain architecture deeply influence the network properties in solidified material since short and linear chains can disentangle relatively easy during crystallization, while large length and chain irregularities impede disentangling, which leads to higher network density. The chain architecture rather than chain length is a primary factor controlling the network properties.

The method allowed determination of the concentration of stress transmitters quite precisely. This seems important for computer modeling and predicting the long-term performance of semicrystalline polymers.

**Keywords:** polyethylene; amorphous phase; molecular network; entanglements; tie molecules; stress transmitters

Download English Version:

<https://daneshyari.com/en/article/7824942>

Download Persian Version:

<https://daneshyari.com/article/7824942>

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