Influence of microstructure and morphology on stress–strain behavior of commercial high density polyethylene

1. Mostafa Zahedi
2. Mostafa Ahmadi*,
3. Mehdi Nekoomanesh

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Abstract

In the previous paper (Zahedi et al., J Appl Polym Sci, to appear) the optimal conditions of a new modeling procedure for correlating a scalar response to an input spectrum were established. In this article the developed model is applied to correlate the stress–strain behavior of several commercial high density polyethylene samples to the spectrums of microstructure and morphology. Molecular weight and lamellar thickness distributions were considered as the input spectrums and Young modulus, stress and strain at the yield and break points were considered as the objective responses. The shape of the kernel functions over molecular weight and lamellar thickness distribution spectrums for each mechanical property gives an explanation of how different regions of the spectrums contribute to create the considered property. The simplicity of the procedure facilitates the interpretation of the complex influences and interactions of different structures and morphologies in various aspects of the mechanical performance of the samples. The proposed model can be used in designed experiments with samples of controlled microstructure and morphology to provide detailed information about the structure–property relationships. © 2008 Wiley Periodicals, Inc. J Appl Polym Sci, 2008