THE INFLUENCE OF PARAFFIN WAX ADDITION ON THE ISOTHERMAL CRYSTALLIZATION OF LLDPE

Thandi P. Gumede[1], Adriaan S. Luyt*[2], Ricardo A. Perez-Camargo[3], Alejandro J. Müller*[3,4]

[1]Deparment of Chemistry, Faculty of Natural and Agricultural Sciences, University of the Free State (Qwaqwa Campus), Private Bag X13, Phuthaditjhaba, 9866, South Africa.
[2]Center for Advanced Materials, Qatar University, PO Box 2713, Doha, Qatar.
[3]POLYMAT and Polymer Science and Technology Department, Faculty of Chemistry, University of the Basque Country UPV/EHU, Paseo Manuel de Lardizabal 3, 20018. Donostia-San Sebastián, Spain.
[4]IKERBASQUE, Basque Foundation for Science, Bilbao, Spain.
(E-mails:tpgumede@webmail.co.za, aluyt@qu.edu.qa, riky0712@gmail.com, alejandrojesus.muller@ehu.es)

ABSTRACT

The influence of paraffin wax addition on the isothermal crystallization kinetics of linear low density polyethylene (LLDPE) was studied in a temperature range where the wax was always in the molten state and could be considered a solvent for LLDPE. The LLDPE/wax blends were prepared by melt mixing in the following compositions: 100/0, 95/5, 90/10, 80/20, 70/30, and 60/40. The results obtained show that the rate of isothermal crystallization is depressed by wax addition at constant crystallization temperatures. LLDPE needs a higher amount of supercooling to start crystallizing as the content of wax increases in the blends. The Flory–Huggins theory (FH) for polymer/diluent mixtures was applied employing equilibrium melting temperature values obtained by extrapolation with the Hoffman–Weeks method. The results of the FH analysis indicate that the interactions between wax and LLDPE are nonlinear and strongly depend on composition. This nonlinear composition dependence of wax/LLDPE interactions is reflected in the complex way in which the overall crystallization kinetics rate depends on both supercooling and composition.

Keywords: LLDPE/wax blends; crystallization