

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Microindentation Studies in Polymers at Very Low Crystallinities

FRANCISCO BALTA-CALLEJA, ARACELI FLORES, IEM, CSIC, Madrid, Spain, MACROMOL. PHYS. TEAM — Indentation with a sharp indenter, involving a deformation on a micron and submicron scale is known to be a convenient method to measure the mechanical properties of polymers [1-2]. The aim of the present talk is to offer an overview on recent advances concerning the microindentation hardness, H , of a series of very low crystallinity (below 7 percent) polyethylene materials relating to nanostructure. The H values for the ethylene-octene copolymers are found to be notably smaller than those of linear and commercial short-chain branched polyethylene. The microhardness of an ethylene based material having a nearly zero crystallinity value has been measured for the first time. Results are discussed on the basis of the surface free energy, dimensions of the nanocrystals and the energy required for plastic deformation. In these low crystallinity materials the deformation modes involve bond rotation of the molecules within the amorphous phase, and elastic compression, bending and slippage of the nanocrystals. According to these deformation mechanisms, which are mainly modulated by the viscosity of the amorphous phase, the average dimensions of the nanocrystals after deformation remain practically unaffected. [1] A Flores, FJ Balta Calleja, T Asano, J Appl Phys 90, 6006 (2001) [2] A Flores, VBF Mathot, GH Michler, R Adhikari, FJ Balta Calleja, Polymer (in press)

Francisco Balta-Calleja
Instituto de Estructura de la Materia, CSIC, Madrid, Spain

Date submitted: 11 Oct 2005

Electronic form version 1.4