

Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Unexpected Shish-Kebab Structure in Shear-Induced Polyethylene Melt¹ BENJAMIN HSIAO, Stony Brook University, LING YANG, Stony Brook University, RAJESH SOMANI, Stony Brook University, LEI ZHU, University of Connecticut, STONY BROOK UNIVERSITY TEAM, UNIVERSITY OF CONNECTICUT TEAM — Unexpected shish-kebab structure with multiple shish in a sheared polymer blend, containing 2 wt% of crystallizing ultra-high molecular weight polyethylene (UHMWPE) and 98 wt% of non-crystallizing polyethylene copolymer matrix, was observed by field-emission scanning electron microscopy (FE-SEM) examinations of the solvent-extracted UHMWPE component. SEM results indicated that the shish-kebab entity contained several independent shish, instead of a single shish as conventionally observed in dilute polymer solutions or thin films. The formation of the shish-kebab structure in UHMWPE could be attributed to the abrupt coil-stretch transition that occurs only in sections of the chain, rather than its entire contour length, and was confirmed by time-resolved synchrotron WAXD and SAXS measurements. X-ray results support the hypothesis that two populations of chain segments (stretched and coiled) in UHMWPE are induced by shear, where the stretched segments form the basis of the multiple shish and the coiled segments crystallize into the kebabs following a diffusion-controlled process.

¹This work was supported by NSF-DMR-0405432

Benjamin Hsiao
Stony Brook University

Date submitted: 22 Dec 2004

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