

Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Ordered structural evolution and relaxation behaviors of a series microphase separated ALEXANDER JIAOKAI JING, ZHIHAO SHEN, SHI JIN, HUABIN WANG, FRANK W. HARRIS, STEPHEN Z. D. CHENG, Maurice Morton Institute and Department of Polymer Science, The University of Akron, THE UNIVERSITY OF AKRON TEAM — A series of “hairy-rod” polyimides, BBPA(n), with multiple alkyl side chains were synthesized. It was found that these polyimides possess a micro-phase separation between the backbones and side chains. This led to the formation of ordered structures in two different length scales, of which both are hexagonal packing: one is attributed to the alkyl side chains on the sub-nanometer scale, and another is for the whole polymer chains on the nanometer scale. The development of the hexagonal structure on the sub-nanometer scale was critically dependent upon the lengths of the alkyl side chains. Three relaxation processes were captured by dynamic mechanical analysis (DM), i.e., segmental motion of the backbones, α ; the melting of the side chain crystals, β_1 , which exists only for the materials with longer side chains ($n = 18, 16$); and the subglass relaxation of side chains, β_2 . The peak relaxation temperature of the α process decreases with increasing the length of side chain, while the one of the β_2 process increases. The activation energy of the α relaxation is relatively independent on the length of side chain, whereas, β_2 process shows the increasing of activation energy with increasing the length of side chain.

Jiaokai Jing
The University of Akron

Date submitted: 30 Nov 2004

Electronic form version 1.4