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Microwave Induced Structural Transitions in Polymers YUNING YANG, Physics Department, University of Massachusetts Amherst, WEI-CHI LAI, SHAW LING HSU, Polymer Science and Engineering Department, University of Massachusetts Amherst — Polymer chain dynamics as a function of temperature (in the range from 20 to 190 °C) have been studied using dielectric spectroscopy within the microwave frequency range. The frequency of radiation was varied from 0.5 GHz to 18 GHz. These studies were conducted for poly(caprolactone) (PCL), poly(ethylene oxide) (PEO), poly(vinyl acetate) (PvAC), poly(lactic acid), polystyrene (PS), nylon 6 and poly(methyl methacrylate) (PMMA). These polymers possess glass temperatures ranging from – 62 °C (PCL) to 110 °C (PMMA). One broad relaxation process was found only for low T_g polymers (PCL and PEO) and not for the others. Results from temperature-dependent dielectric spectroscopy indicate that the relaxation process follows an Arrhenius T dependence suggesting the relaxation process is due to local motions. Moreover, the effect due to end groups was investigated by comparing results of PEO with hydroxy versus methoxy end groups. It was determined the structural transitions measured are not with end group motions. From the Debye diffusive model, the relaxation process is concluded to be associated with the short segmental motion along the backbone.

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