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Effects of Thickness, Molecular Weight and Temperature on Kinetics of Photo-induced Trans→Cis Isomerization for Azobenzene Tagged to Polystyrene in Films YOHEI TATEISHI, KEIJI TANAKA, TOSHIHIKO NAGAMURA, Kyushu University — Photoisomerization of azobenzene (Az) tagged to polystyrene (PS) in films was studied as functions of thickness, PS molecular weight and temperature. The photoisomerization reaction in solid films was composed of fast and slow modes. The fractional of the fast mode (I_1) increased with decreasing thickness once the films became thinner than a few hundreds of nanometers. This can be explained in terms of a surface layer in which the photoisomerization proceeds faster, and the effect becomes remarkable with decreasing thickness due to a large surface to volume ratio. Since the thickness dependence of I_1 fraction was insensitive to the molecular weight of PS, it is likely that the kinetics was coupled with molecular motion with a relatively small scale. Comparing the temperature-I_1 relation with viscoelastic data of the PS, it was concluded that this was the case and the γ and β relaxation temperatures in the surface region were comparable to those in the bulk. Interestingly, the thickness of the surface layer, estimated through a layer model analysis, varied with changing temperature.

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