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Effect of the interfacial interaction on the relaxation of polymer melts in nanofilms LEI LI, YONGJIN WANG, Department of Chemical Engineering, University of Pittsburgh, JIANING SUN, J.A. Woollam Co. — The relaxation of polymer melts in nanofilms could be orders of magnitude slower than in bulk. To date, the governing mechanism remains unclear on the role of spatial confinement and interfacial interaction. Here we report the experimental results indicating that the polymer-substrate interfacial interaction plays a key role in the relaxation. Two perfluoropolyethers (PFPEs) with the same backbone and different endgroups, one polar and the other non-polar, have been studied. The relaxation of the nanofilms on silicon wafers was characterized by the contact angle measurement. For the PFPE with polar endgroups, the contact angle "relaxes" with time and the relaxation time constant, obtained from KWW model, is ten orders of magnitude higher than that of bulk polymer. However, for the PFPE with non-polar endgroups, the contact angle relaxation was not observed. The experimental results indicate that the relaxation is thermodynamically driven by the attractive interaction between the polar endgroups of the polymers and the polar sites on the solid substrate. The very slow kinetics of the relaxation has been attributed to the heterogeneity of the polymer-solid interfacial interaction and the cooperative nature of the molecular motions during the relaxation.

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