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Competitive effects in the dynamics of confined ultra-thin polymer films[1] CHRYSOSTOMOS BATISTAKIS, ALEXEY LYULIN, THIJS MICHELS, Eindhoven University of Technology — Fillers, as carbon black or silica, are widely used in polymer systems to improve mechanical properties. In high volume fractions, these fillers connect to each other through polymeric bridges and they create a percolation network inside the polymer matrix. The rigidity of this network depends on the filler volume fraction and is rapidly breaking down under loading. The scope of this work is to understand the polymer dynamical behavior of the interparticle polymeric bridges. For that purpose we have performed molecular-dynamics (MD) simulations on coarse-grained polymer films which are confined between two crystalline Lennard-Jones substrates for different substrate-substrate separations. Various polymer-substrate attraction strengths have been chosen. The polymer structure and segmental dynamics in different film layers has been analyzed. We found that increasing attraction strength leads to deceleration of the film dynamics due to a slowing down close to the substrates, but decrease of film thickness leads to an acceleration of these dynamics. We attribute this acceleration to finite-size scaling effects. For thick films an acceleration of dynamics in the middle takes place for sufficiently high attraction strengths due to the effective increase of the glassy layers thicknesses

[1]Dutch Polymer Institute, project #701

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