

Abstract Submitted
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The relationship between the T_g depression and the speeding up of physical aging in polystyrene/gold nanocomposites VIRGINIE M. BOUCHER, DIPC, DANIELE CANGIALOSI, ANGEL ALEGRIA, JUAN COLMENERO, CSIC — The effect of gold nanoparticles on the segmental dynamics, glass transition (T_g) and physical aging of polystyrene (PS) was studied in PS/Gold nanocomposites samples containing 5 and 15 wt.% of 60 nm spherical gold nanoparticles, surface-treated with thiolated-PS. While the segmental dynamics of PS, as assessed by broadband dielectric spectroscopy (BDS), was found to be unchanged in presence of gold nanoparticles, the calorimetric T_g of PS was shown to decrease with increasing the amount of nanoparticles in the samples. Furthermore, the physical aging of PS, monitored by measuring the enthalpy relaxation below T_g by means of DSC, was shown to speed up with increasing the nanoparticles weight fraction, i.e. the amount of PS/Gold interface in the hybrid material. Thus, the main conclusion of our work is that PS molecular mobility and out-of-equilibrium dynamics are decoupled in these nanocomposites. The significant effect of the amount of PS/Gold interface on both the physical aging rate of PS and the calorimetric T_g depression are quantitatively accounted for by a model based on the diffusion of free volume holes towards polymer interfaces, with a diffusion coefficient depending only on the molecular mobility.

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