

The role of interfacial elasticity on the rheological behavior of polymer blends

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In this work, the influence of interfacial modification on the rheological behavior of polymer blends was investigated. First, commercial blends of polypropylene and ethylene-propylene copolymer, PA6/EPM, non-compatible and compatibilized with EPM grafted with maleic anhydride, with high viscosity and elasticity ratios were studied. The observation of the morphology frozen during extension tests seemed to indicate that the droplets of the highly compatibilized blends are slightly deformed unlike those of the non-compatible ones. Stress relaxation experiments, both in shear and extension, showed that the introduction of the compatibilizer leads to the appearance of a second very long relaxation mechanism, the question then being what is its cause. In order to better understand the relative importance of relaxation of the droplets and relaxation of the interfaces in this kind of compatibilized blends, model high viscosity ratio blends of optically transparent materials, poly(methylmethacrylate), PMMA, polystyrene, PS, and oxazoline-modified polystyrene, PSOX were prepared. This allows SALS to be used in dilute blends to complement the rheometrical characterization and thus evaluate the deformation of the droplets in transient shear flows. In these blends there is also an additional longer relaxation time present but no changes in the morphology can be readily observed. In addition, the blend with functionalized PS shows a droplet deformation in the vorticity direction, which is an indication of an increase in the elasticity of the interface. Thus, our findings seem to indicate that the main factor behind the increase in relaxation time stress relaxation at and in the interfaces and not droplet deformation and recovery. These results were confirmed when PP/EVOH blends, non-compatible and compatibilized with Na⁺ were tested. In this case the elasticity of the interface is negligible and compatibilization did not alter the relaxation behavior.