

The Effect of Molecular Structure of formed copolymer and shear force on Morphological Changes at Polymer-Polymer Interface

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Abstract

In this study we investigated the effect of molecular structure of formed copolymer on morphological changes at reactive polymer-polymer interface. Also, we made an attempt to find the relation between the shear force and interfacial reaction.

The blend systems employed in this study was glycidylmethacrylate terminated polystyrene (PS-GMA) and an carboxylated poly(methyl methacrylate) (PMMA-COOH). All samples were synthesized by an anionic polymerization. In order to get various molecular structure of formed copolymer, we synthesized three kind of PMMA-COOH with different position of carboxylate group – middle, a third and end of chain. We prepared the film, PS-GMA/PMMA-COOH/Si-wafer by sequential spin-casting. We make the reaction occur at 180°C for 24 hrs. We observed the interface by AFM after removing of PS by selective solvent rinsing. And we examined the presence of microemulsion or micelle by TEM study.

And in order to study the effect of the shear force on the interfacial reaction, we prepared two plates of each polymer using compression molding with a smooth surface molder, then put one upon another. As soon as these two plates welds together inside a rheometer under nitrogen environment, the torque and moduli were obtained with reaction time at different frequency and strain.

Through the observation of the interface, we found the effect of molecular structure of formed copolymer on reaction and morphological change at polymer-polymer interface. We found that the Y-shape of formed copolymer helped the interface to generate more than diblock shape. We also found the relation between shear force and interfacial reaction.