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Two antagonistic effects of flow/mixing on reactive polymer blending

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Abstract

Reactive polymer blending is basically a flow/mixing-driven process of interfacial generation, interfacial reaction for copolymer formation and morphology development. This work shows two antagonistic effects of mixing on this process: while mixing promotes copolymer formation by creating interfaces and enhancing collisions between reactive groups at the interfaces, excessive mixing may pull the in-situ formed copolymer out of the interfaces to one of the two polymer components of the blend, especially when the copolymer becomes highly asymmetrical. As such, the copolymer may loss its compatibilization efficiency. The mixing-driven copolymer pull-out from the interfaces is a catastrophic process (less than a minute), despite the high viscosity of the polymer blend. It depends on the molecular architecture of the reactive compatibilizer, polymer blend composition, mixing intensity and annealing. These findings are obtained using the concept of reactive tracer-compatibilizer and a model reactive polymer blend.

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