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Microphase Separation Induced by Interfacial Segregation of Isotropic, Spherical Nanoparticles MICHAEL J. A. HORE, MOHAMED LARADJI, The University of Memphis, Dept. of Physics — In a recent experiment by Chung et al. [Nano Lett. 5, 1878 (2005)] on an immiscible polymer blend containing silica nanoparticles, it was shown that the phase separation of the two polymers can be prevented as a result of the self-assembly of the nanoparticles at the interfaces between the two polymers. This effect is observed despite the fact that these nanoparticles are spherical and isotropic, and therefore fundamentally different from typical anisotropic surfactant particles, known to lead to microphase separated structures. Motivated by these experiments, we performed large scale simulations, based on the dissipative particle dynamics approach, on immiscible binary (A-B) fluids containing moderate volume fractions of isotropic nanoscale spherical particles, N . The nanoparticles preferentially segregate at the interfaces between the two fluids if the pairwise interactions between the three components are such that $\chi_{AB} > |\chi_{AN} - \chi_{BN}|$. We found that at late times, the average domain size saturates to a value, $R \sim r/\varphi$, where r and φ are the radius and the volume fraction of the nanoparticles, respectively. The dynamics of the phase separation process, dynamical scaling, and thermodynamic stability of the microphase-separated structures will be discussed.

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