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Dynamics of Ternary Mixtures with Photosensitive Chemical Reactions: Designing Three Dimensional Hierarchically Ordered Composites OLGA KUKSENOK, RUI D.M. TRAVASSO, ANNA C. BALAZS, University of Pittsburgh — Using coarse-grained computer modeling, we show that photo-induced chemical reactions can be exploited to create long-range order in binary and ternary mixtures. In the binary case, a photosensitive AB blend is illuminated by a spatially uniform light and therefore undergoes both a reversible chemical reaction and phase separation. The late-time morphology resembles the lamellar morphology of diblock copolymers, with lamellae oriented isotropically within the sample. Rastering a secondary, higher intensity light over the sample locally increases the reaction rate and introduces long-range ordering along the rastering direction (i.e., effectively "combing" the lamellar domains). We also illustrate an application of our combing technique as a replicative process, which transfers an image on the substrate through the sample. In the ternary case, we add a non-reactive component C, which is immiscible with both A and B. We show that C migrates to regions that are illuminated by the secondary, higher intensity light. Using a stationary secondary light source allows us to effectively write a three-dimensional pattern of C onto the AB sample. Rastering over the ternary system with an additional light source leads to hierarchically ordered patterns of A, B and C.

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