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Creating defect free structures by directed photochemical reaction in a ternary phase separating system PRATYUSH DAYAL, OLGA KUKSENOK, ANNA BALAZS, University of Pittsburgh — We present a technique to create long range ordered structure in photosensitive reaction-diffusion systems. Our approach utilizes a reversible photochemical reaction between species A and B in a ternary immiscible ABC blend to yield a defect-free arrangement of phase separated ABC domains. The process essentially consists of two steps. First, the sample is irradiated by virtue of masks creating an illumination pattern which allows the migration of AB components to the covered regions at the expense of the C component. As a result the C component is pinned onto the irradiated regions which in turn leads to pinning of AB domains thereby creating a long range order in the system. Second, the masks are completely removed and whole sample is irradiated uniformly. In this case, the system evolves into a distinctly different ordered structure. The ordering of the system, either before or after removal of the mask, can be locked in by quenching the system at appropriate time. Simulation studies reveal that the ordering can be controlled by changing the initial concentration of the blend as well as by varying size and arrangement of the holes in the mask. The defect free morphology has been demonstrated for rectangular, hexagonal and parallel arrangement of the masks.

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