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Photopolymerization induced phase ordering in confined regions[1]
THEIN KYU, University of Akron, RUSHIKESH MATKAR, SCOTT MENG, SOO-JEOUNG PARK, GREG YANDEK, University of Akron — Phase ordering in confined spaces such as stratified layers or columnar domains is of interest for a variety of optical and electronic applications. We have investigated various possibilities of creating photonic crystal structures using an optical wave interference technique subjected to holographic photopolymerization of acrylate systems blended with nematic liquid crystals or conductive crystalline polymers. Melting point depression is known to occur between acrylate monomers and polyethylene oxide or succinonitrile. During the course of photopolymerization, the increase in molecular weight of acrylate and subsequent network formation have shifted the melt point upward above the reaction temperature, which in turn drives PEO to undergo crystallization; hereafter called polymerization-induced crystallization. A variety of conditions have been investigated in the framework of phase field theory for crystallization by coupling with the extended Flory-Huggins theory for polymer blend demixing. The phenomenon of polymerization-induced crystallization during photolithography has been investigated with emphasis on the effect of intensity gradient on the emerging morphology. Additionally, crystallization in confined regions has also been explored.

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