

Abstract Submitted
for the PSF09 Meeting of
The American Physical Society

Structured illumination for stress reduction gloss reduction and 3 dimensional patterning of photopolymers¹ CHRIS CORETSOPOULOS, PETER GANAHL, ALEC SCRANTON, University of Iowa — “Structured illumination” method is based upon a two-stage illumination process in which a photoactive polymer is first illuminated in a pattern of light and dark regions. During this structured illumination stage, unreacted monomer from the dark region will migrate in response to the polymerization and the resulting shrinkage thereby preventing the development of stress. At the end of the structured illumination stage, the system contains patterned regions of stress-free polymer among pools of unreacted monomer. After a specified duration of structured illumination, the second, flood cure, stage begins. Here the entire system is illuminated to achieve a consistently high conversion throughout the coating. Experimental results confirm that over 90% of the polymerization shrinkage stress can be eliminated using this approach. A further benefit of this method is the production of 3 dimensional curved objects that can be photo-patterned with simple mask structures. This is in contrast to steep walled structures produced by conventional photolithography. The resulting polymer has been used to reduce gloss in surface coatings without the need of using additives, and to make micro scale 3D features and optical elements and microstructures.

¹Support from IUCRC for fundamentals of photopolymerization.

Chris Coretsopoulos
University of Iowa

Date submitted: 16 Oct 2009

Electronic form version 1.4