MAR15-2014-000667

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Thermal Imaging Processes of Polymer Nanocomposite Coatings

JEFFREY METH, CR&D, DuPont Co.

Laser induced thermal imaging (LITI) is a process whereby infrared radiation impinging on a coating on a donor film transfers that coating to a receiving film to produce a pattern. This talk describes how LITI patterning can print color filters for liquid crystal displays, and details the physical processes that are responsible for transferring the nanocomposite coating in a coherent manner that does not degrade its optical properties. Unique features of this process involve heating rates of 10^7 K/s, and cooling rates of 10^4 K/s, which implies that not all of the relaxation modes of the polymer are accessed during the imaging process. On the microsecond time scale, the polymer flow is forced by devolatilization of solvents, followed by deformation akin to the constrained blister test, and then fracture caused by differential thermal expansion. The unique combination of disparate physical processes demonstrates the gamut of physics that contribute to advanced material processing in an industrial setting.