Thermally induced phase separation of liquid crystal and poly(N-vinyl carbazole) substrates

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In the current study, a novel method of advanced thermally induced phase separation (ATIPS) of liquid crystals (LCs) and polymers is presented. The process involves a combination of solvent- and thermal-induced phase separations. The LCs and PVK play the roles of solvent and solute, respectively, during the processes of ATIPS. The nematic LC sample fabricated by two substrates coated with poly(N-vinyl carbazole) (PVK) films is heated and then cooled, generating the rough PVK layers onto the surfaces of the substrates. The LC sample having rough PVK layers produces micron-sized, multiple domains of disordered LCs that can scatter incident light. Additionally, an application of a scattering mode light shutter fabricated by ATIPS is reported. The shutter has the advantages of low driving voltage, fast response, polarization-independent scattering, high contrast ratio, and being polarizer free. The electro-optical properties of the light shutter and the morphologies of the PVK layers are examined in detail. The present study is the first to report such a phase separation method and investigate the high performance of an LC device.

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