Liquid Crystal Mixtures for Dynamic Holographic Display

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A dynamic holographic display featuring the quantum-dot-doped liquid crystal (QDD-LC) mixture is proposed. Its build-up time for each hologram is on the order of several to tens of milliseconds, depending on the recording intensity, applied voltage, and grating period. The maximum diffraction efficiency is measured as 20%. In our experiments, 60-Hz holographic videos of red, green, and blue colors are demonstrated.

The QDD-LC mixture is prepared by doping the quantum dots (ZnS/InP) at a weight ratio of 0.05% into the nematic LC (5CB) [1]. Figure 1 exhibits the change of build-up time with respect to the increasing applied voltages. It can be seen that higher voltage leads to the faster build-up time, as a result of the boosted charge separation and migration [2]. Figure 2 shows a series of snapshots captured from the holographic videos at different time. Three lasers of red, green, and blue colors are all set to be p-polarization to probe the recording region of the sample, respectively. No residual images are observed. By using the angular multiplexing technique [3], it is accessible to merge three reconstructed colors to realize the full-color dynamic holographic display.

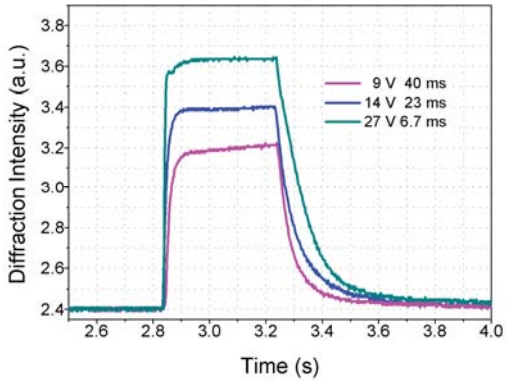

Fig. 1. First-order diffraction intensity and build-up time with respect to different applied voltages.

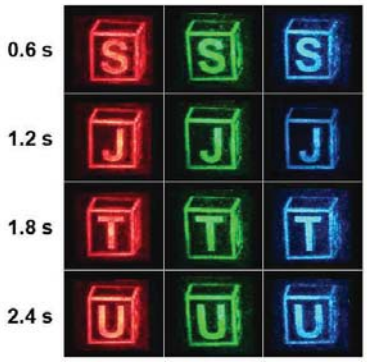

Fig. 2. Snapshots from the holographic videos reconstructed by R/G/B lasers.

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References

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