PTR Investigation of Thermal Conductivity of a PDLC Film under Electric Field and the Effects of Depolarization Fields

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Polymer Dispersed Liquid Crystals (PDLCs) consist of liquid crystal (LC) droplets inside a polymer matrix. The possibility for changing LC alignment in PDLCs with an external electric field (EF) makes them useful in technology. Since LC possesses thermal conductivity anisotropy which can be controlled by an EF, thermal conductivity of PDLCs can also be tuned by an EF. In this work, we have established a relationship between the effective thermal conductivity of the film and the average orientation of the LC molecules which has been described using order parameters [1]. Thermal conductivity of Polystyrene-5CB samples, prepared by solvent induced phase separation technique, is investigated using an adapted Photothermal Radiometry technique [2]. The results show that the thermal conductivity of PDLC films depend on the amplitude and frequency of the EF. These behaviors can be explained by the reorientation of the LC molecules inside the droplets and by the effects of depolarization field, described by the Maxwell-Wagner-Sillars theory. Finally, the experimental results give information on electrical properties and elastic parameters of the polymer and LC [3].

References

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