Abstract

Dielectric and Electro-Optical Properties of Dilute Suspensions

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The dielectric properties of dilute liquid suspensions of microellipsoids may be controlled by reorientation of the particles in an applied electric field. The particle orientation distribution is determined by a thermal average of the electrostatic energy that seeks to orient the particles in the direction of the applied field. The magnitude of the resulting electro-optical effects is determined by the intrinsic dielectric anisotropy of the particles and by their shape. By calculating the field-dependent dielectric tensor of such a suspension, we find an explicit link between the particle properties, their orientation distribution and the field induced birefringence and electro-optical phase shift for fields of arbitrary strength. The electro-optical effects turn out to be quite sensitive to changes in particle parameters and may therefore be useful for studying reorientation phenomena in these materials.

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