Electric Control Of Carbon Nanotubes And Nematic Structure

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ABSTRACT

We have created a new, simplified mathematical design of a polarized light Ellipsometer based on rotation of a quarter wave plate. Using Stokes analysis we have derived the matrix forms of the optical elements under conditions of rotating their analyzer. This method of universal compensation allows us to calculate the two dimensional map of phase shift about the structure and the orientation inside. In lab model systems, as in liquid crystals, the string dynamics of the sample Holder is implemented, we develop a method to measure the phase shift and the azimuthal and polarized extinction of optically anisotropic liquid crystalline samples (a general phase shifter). Our aim is to provide a molecular level understanding of the nematic to isotropic phase transition of the liquid crystal. The results for beech wood polarized light ellipsometry in the optical and polarized light is corroborated with the previous work in the literature.

BACKGROUND AND THEORY

Liquid crystals are one-dimensional ordered structures of molecules with a high degree of freedom. They are neither liquids nor solids, but rather a state of matter that lies between these two extremes. Liquid crystals display various types of ordered structures, such as nematics, smectics, and cholesterics, which are characterized by their unique optical and physical properties.

**Light scattering** is a technique that allows us to observe the structural order in a sample. It is based on the fact that light is scattered by the molecules in a liquid crystal, and the pattern of scattering depends on the order of the sample.

**Dielectric constant** is a measure of how much a material can store electric energy in an electric field. It is a fundamental property of a material, and it determines how it responds to an applied electric field.

**Dielectric anisotropy** is the difference between the dielectric constant in the parallel and perpendicular directions in the liquid crystal. The reason for choosing polarized light ellipsometry to study the order in liquid crystals is because it has the capability to measure the dielectric anisotropy of a sample.

**Polarization** is the orientation of the electric field of an electromagnetic wave. It is an important property of light, and it is used to study the properties of materials.

**Optical anisotropy** is the difference between the refractive indices in the parallel and perpendicular directions in the liquid crystal. It is a fundamental property of liquid crystals, and it is used to study the properties of liquid crystals.

**Dielectric permittivity** is a measure of how much a material can store electric energy in an electric field. It is a fundamental property of a material, and it determines how it responds to an applied electric field.

**Light scattering and optical effects** are used to study the properties of liquid crystals. They are based on the fact that light is scattered by the molecules in a liquid crystal, and the pattern of scattering depends on the order of the sample.

**Polarized light** is light that has a specific direction of polarization. It is used to study the properties of materials, because it can selectively detect certain properties.

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