Response and Applications 4: 11:25 - 12:00 a.m.

Stress and E-field Induced Structural Changes in Electroclinic Elastomers

Banahalli R. Ratna, Christopher M. Spillmann, John H. Konnert, Jeffrey R. Deschamps, and Jawad Naciri

Center for Bio/Molecular Science and Engineering, Naval Research Laboratory, 4555 Overlook Ave. SW,

Washington, DC 20375

ABSTRACT

Electric-field induced actuation has been observed in an electroclinic elastomer (ELCE) due to the coupling of the molecular tilt to the polymer network. The result is a macroscopic contraction along the layer normal and a shear extension in the direction of the smectic layers and orthogonal to the direction of the electric field. The structure and molecular packing of an actuated electroclinic liquid crystal elastomer is examined in three dimensions using x-ray diffraction. A model based on periodic pair distribution functions provides key insights toward a detailed delineation of the molecular packing in the elastomer film. A three-dimensional reconstruction of the x-ray scattering intensity under mechanical load and in the presence of electric fields of varying strength and opposing polarity reveals a detailed look into the molecular packing in an unstressed state and its changes with the applied external fields.