

Dielectric function of a poly(benzimidazobenzophenanthroline) ladder polymer

Abstract

The dielectric function and the effective conjugation length of an organic material determine the binding energy of an exciton formed after photon absorption. In ladder polymers the conjugation length is large and the size of the exciton is in principle not limited by its conjugation length, since it can delocalize along the backbone of the polymer. In this work, the anisotropic dielectric function of poly(benzimidazobenzophenanthroline) (BBL) in the UV-visible and infrared spectral range is obtained by DFT calculations and by modeling ellipsometric data, revealing both ionic and electronic contributions. For spin-coated BBL polymer thin films, we show uniaxial anisotropic behavior with high differences between the in-plane and out-of-plane dielectric function. We obtain a high dielectric constant of 8.3 in the direction of the polymer. © 2015 American Physical Society.