Abstract

Photophysics of Pristine and C60 Doped Disubstituted Polyacetylene

I. I. GONTIA[¶] and Z. V. VARDENY

Physics Department
University of Utah
Salt Lake City, UT 84112
USA

ilarie@physics.utah.edu

Received: Fri, 29 Mar 2002 11:58:45

We present continuous wave optical spectroscopies of films of disubstituted polyacetylene poly-disubstituted-acetylene (PDPA-nBu). We found that although PDPA-nBu is a degenerate ground state polymer, nevertheless it shows strong photoluminescence (PL) with quantum efficiency larger than 60%. Polarized PL measurements show that the PL emission originates from intrachain excitons rather than from the polymer side groups. The absorption spectrum was measured and compared with the proposed model of Shukla et al. The photoinduced absorption (PA) spectrum of PDPA-nBu in toluene solution indicates that only polarons are photoegenerated, whereas PDPA-nBu films show both polaron and soliton photoexcitations. We also investigated the charge transfer (CT) process in the PDPA-nBu/C_{60} composites. While the absorption spectrum in the visible and infrared ranges of PDPA-nBu/C_{60} blend do not show any evidence for CT in the ground state, the PA spectrum shows the signature of CT in the form of a PA band that peaks at about 1.15 eV, which is associated with C_{60}^{-}. PADMR spectroscopy also shows the signature of the photoinduced CT reaction. We also observed two spins 1/2 resonances one associated with positive polarons of the polymer chains and the other related to C_{60}^{-}.

[¶]Presenter