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Title:Photoexcitation Dynamics in Films of C₆₀ and Zn Phthalocyanine with a Layered Nanostructure

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Abstract:We elucidate photoexcitation dynamics in C₆₀ and zinc phthalocyanine (ZnPc) from picoseconds to milliseconds by transient absorption and time-resolved terahertz spectroscopy. Autoionization of C₆₀ is a precursor to photocarrier generation. Decay of the terahertz signal is due to decreasing photocarrier mobility over the first 20 ps and thereafter reflects recombination dynamics. Singlet diffusion rates in C₆₀ are determined by modeling the rise of ground state bleaching of ZnPc absorption following C₆₀ excitation. Recombination dynamics transform from bimolecular to monomolecular as the layer thickness is reduced, revealing a metastable exciplex at the C₆₀/ZnPc interface with a lifetime of 150 μs.

Number of references:38

Inspec controlled terms:autoionisation - carrier mobility - diffusion - fullerenes - ground states - high-speed optical techniques - inhomogeneous media - nanostructured materials - organic semiconductors - photoconductivity - photoexcitation - semiconductor thin films - terahertz wave spectra - time resolved spectra - zinc compounds

Uncontrolled terms:photoexcitation dynamics - Zn-phthalocyanine thin films - C₆₀ thin films - layered nanostructure - picosecond-millisecond transient absorption - time-resolved terahertz spectroscopy - autoionization - photocarrier generation - photocarrier mobility - recombination dynamics - singlet diffusion rates - ground state bleaching - metastable exciplex - photoconductivity - time 20 ps - time 150 μs - C₆₀

Inspec classification codes:A7847 Ultrafast optical measurements in condensed matter - A7870G Microwave and radiofrequency interactions with condensed matter - A7220F Low-field transport and mobility; piezoresistance (semiconductors/insulators) - A6630H Self-diffusion and ionic conduction in solid nonmetals - A7240 Photoconduction and photovoltaic effects; photodielectric

effects - A7865V Optical properties of fullerenes and related materials (thin films/low-dimensional structures) - A7360T Electrical properties of fullerenes and related materials (thin films/low-dimensional structures) - A7360R Electrical properties of organic compounds and polymers (thin films/low-dimensional structures) - A7865T Optical properties of organic compounds and polymers (thin films/low-dimensional structures) - A7220J Charge carriers: generation, recombination, lifetime, and trapping (semiconductors/insulators) - B4210 Photoconducting materials and properties - B0587 Fullerenes, carbon nanotubes, and related materials (engineering materials science) - B2520M Other semiconductor materials

Numerical data indexing:time 2.0E-11 s;time 1.5E-04 s

Chemical indexing:C60/el C/el

Treatment:Experimental (EXP)

Discipline:Physics (A); Electrical/Electronic engineering (B)

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