

Faculty of Science

Department: Chemistry

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Title: Photophysical properties and semiempirical calculations of perylene 3,4,9,10-tetracarboxylic tetramethyl ester (PTME)

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Abstract:

The spectral behavior and fluorescence quantum yield of perylene-3,4,9,10-tetracarboxylic tetramethylester (PTME) have been measured in different solvents. Both electronic absorption and fluorescence spectra are not sensitive to medium polarity. The dye exhibits high fluorescence quantum yield and high photostable. Crystalline solid of PTME gives excimer-like emission at 530 nm. The laser activity of PTME has been investigated. The dye solution in N,n-dimethylformamide (DMF) gives laser emission around 480 nm upon excitation by 337.1 nm nitrogen laser pulse. The excitation energy transfer from 7-dimethylamino-4-methylcoumarine (DMC) to PTME has also been studied and the value of energy transfer rate constant, K_{ET} , and critical transfer distance, R_0 indicate a forster-type mechanism. The photodecomposition of PTME in chloromethane solvents has been also studied. We applied semiempirical MO calculations using (PM3 and ZINDO-CI) calculations to explain the geometric and electronic behaviors of the PTME molecule in both ground and excited states and make a correlation with the experimental observations.

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Department: Chemistry

Name: El-Daly, Samy A.

Title: Electrochemical studies of 1,4-Bis[2-(2-pyridyl)-vinyl] benzene and 1,4-Bis[2-pyridyl] vinyl] benzene laser dyes via cyclic voltammetry, convolutive voltammetry and digital simulation methods.

Authors: El Daly, Samy A., El-Hallag, Ibrahim S, Ebeed, Ezeiny M. & Ghonem, Mohamed M.

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Abstract:

Electrochemical properties of two diolefinic laser dyes namely 1,4-bis [2-(2-pyridyl)-vinyl] benzene (2PVB) and 1,4-bis[2-(4-pyridyl) vinyl] benzene (4PVB) have been investigated using cyclic voltammetry and convolutive voltammetry combined with digital simulation at a platinum electrode in 0.1 mol/L tetrabutyl ammonium perchlorate (TBAP) in two different solvents acetonitrile (CH₃CN) and dimethylformamide (DMF). The species were reduced via consumption of two sequential electrons to form radical anion and dianion. In switching the potential to positive direction, the two compounds were oxidized by loss of one electron, which was followed by a fast isomerisation process. The electrode reaction pathway and the electrochemical parameters of the investigated compounds were determined using cyclic voltammetry. The extracted electrochemical parameters were verified and confirmed via digital simulation and convolutive voltammetry methods.

Keywords:

Cyclic voltammetry, convolutive voltammetry, digital simulation, diolefinic laser dyes, electrochemical parameters.