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Spectroscopic studies and laser activity of 3-(4-dimethylamino-phenyl)-1-(2,5-dimethyl-furan-3-yl)-propenone (DDFP): A new green laser dye

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Abstract

Photophysical parameters such as singlet absorption, molar absorptivity, oscillator strength, dipole moment, fluorescence spectra, and fluorescence quantum yield of DDFP were measured in different solvents. DDFP dye exhibits an essentially larger redshift of the emission spectra than the absorption one as solvent polarity increases. This fact indicates that the dipole moment of the DDFP dye is higher in singlet excited state than that in the ground one. A crystalline solid of DDFP gives excimer like emission at 575 nm. The absorption and emission spectra of DDFP have been investigated in organized media of aqueous micellar solutions. The critical micelle concentration (CMC) of sodium dodecyl sulfate (SDS) and cetyltrimethyl ammonium bromide (CTAB) are determined using DDFP dye. The photo-reactivity and the net photochemical quantum yield ($\phi(c)$) of DDFP dye was determined in different solvents. The dye is relatively photostable in DMSO but undergoes photodecomposition in chloromethane solvents. Dye solution circa 1×10^{-4} mol dm⁻³ in dimethyl sulfoxide (DMSO) gives laser emission in the range 490-560 nm with emission maximum at 515 nm upon pumping by nitrogen laser (337.1). The gain coefficient (α) and emission cross section $\sigma(e)$ at maximum laser emission are also determined. (C) 2013 Published by Elsevier B.V.

Keywords

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