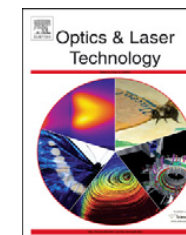




Contents lists available at ScienceDirect

Optics & Laser Technology

journal homepage: www.elsevier.com/locate/optlastec

Photophysical parameters and fluorescence quenching of 7-diethylaminocoumarin (DEAC) laser dye

E.H. El-Mossalamy^{a,*}, A.Y. Obaid^a, S.A. El-Daly^b

^a Chemistry Department, Faculty of Science, King Abdul Aziz University, P.O. Box. 80203, 21589, Saudi Arabia

^b Chemistry Department, Faculty of Science, Tanta University, Tanta, Egypt

ARTICLE INFO

Article history:

Received 9 May 2010

Received in revised form

15 January 2011

Accepted 7 February 2011

Available online 21 March 2011

Keywords:

DEAC- laser dye TCNQ PA E. absorption

Emission

Fluorescence and dipolemoment

ABSTRACT

The optical properties including electronic absorption spectrum, emission spectrum, fluorescence quantum yield, and dipole moment of electronic transition of 7-diethylaminocoumarin (DEAC) laser dye have been measured in different solvents. Both electronic absorption and fluorescence spectra are red shifted as the polarity of the medium increases, indicating that the dipole moment of molecule increases on excitation. The fluorescence quantum yield of DEAC decreases as the polarity of solvent increases, a result of the role of solvent polarity in stabilization of the twisting of the intramolecular charge transfer (TICT) in excited state, which is a non-emissive state, as well as hydrogen bonding with the hetero-atom of dye. The emission spectrum of DEAC has also been measured in cationic (CTAC) and anionic (SDS) micelles, the intensity increases as the concentration of surfactant increases, and an abrupt change in emission intensity is observed at critical micelle concentration (CMC) of surfactant. $2 \times 10^{-3} \text{ mol dm}^{-3}$ of DEAC gives laser emission in the blue region on pumping with nitrogen laser ($\lambda_{\text{ex}} = 337.1 \text{ nm}$). The laser parameters such as tuning range, gain coefficient (α), emission cross section (σ_e), and half-life energy have been calculated in different solvents, namely acetone, dioxane, ethanol, and dimethylformamide (DMF). The photoreactivity of DEAC has been studied in CCl_4 at a wavelength of 366 nm. The values of photochemical yield (ϕ_c) and rate constant (k) are determined. The interaction of organic acceptors such as picric acid (PA), tetracyanoethylene (TCNE), and 7,7,8,8-tetracyanoquinone-dimethane (TCNQ) with DEAC is also studied using fluorescence measurements in acetonitrile (CH_3CN); from fluorescence quenching study we assume the possible electron transfer from excited donor DEAC to organic acceptor forming non-emissive exciplex.