Synthesis and optical properties of linear and branched styrylpyridinium dyes in different environments

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Streszczenie

A common motif in the design of organic dye compounds is that of an electron donor and an acceptor moiety linked through a conjugated bridge, but more complicated structures can also be built using such motifs as building blocks. Following these principles, we synthesized two styrylpyridinium dyes, a linear one and a branched molecule composed of three units of the mono moiety connected by benzyl group and investigated their photophysical properties in different environments: their linear absorption, one-photon excited fluorescence and two-photon absorption properties. The compound with the symmetrically substituted phenyl core shows a redshift of the absorption and fluorescence bands. Spectrally resolved two-photon absorption cross section measurements carried out by femtosecond Z-scan technique show that the value for the trimer is over twelve times larger than that for the monomer, and not just three times as expected from the molar mass increase. Large two-photon absorption (2PA) values were measured in the near infrared (NIR) region. The prototropic study indicates that the protonation of the amino group blocks a lone pair on the nitrogen atom, making the photoinduced electron transfer process from the amine group to the pyridinium ring ineffective. This results in the reduction of the long-wavelength absorption with a simultaneous increase of the band in the short-wavelength region of the spectrum and a decrease in the fluorescence intensity. The behavior of dyes in the presence of β-cyclodextrin was also studied based on NMR, UV–Vis, and fluorescence spectroscopy. The performed experiments indicated the formation of 1:1 inclusion complex in aqueous solution.

Słowa kluczowe

Styrylpyridinium dyes, Synthesis, Absorption and emission spectroscopy, Two-photon absorption, Cyclodextrins, Inclusion complexes

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