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Effect of solvent polarity and lipid chemical structure on naphthalene derivatives excitation spectra.

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Abstract

Professor Gregorio Weber first synthesized several naphthalene derivatives for the study of the fluorescence dipolar relaxation. Among them is the 2-dimethylamino-6-lauroylnaphthalene (LAURDAN), which became a popular membrane polarity probe. Beside the emission spectral shift due to dipolar relaxation occurring in polar solvents, this probe also shows variations of the excitation spectrum. In particular the appearance of a red excitation at about 390 nm band in polar solvents. In ester phospholipids, LAURDAN excitation red band is particularly intense in the gel phase, while it displays a lower intensity in the liquid-crystalline phase of ester phospholipids. In both phases of ether phospholipids, glycosphingolipids and sphingomyelin. The occurrence and intensity of the red excitation band also depends upon the residue in the position 2 of the naphthalene moiety. To explore this last point, excitation spectra of the 2-hydroxy and 2-methoxy-6-lauroylnaphthalene (LAURNA and LAURMEN, respectively) in solvents and in lipids were examined. We also studied the features of the excitation spectrum of the 2-dimethylamino-6-propionynaphthalene (PRODAN) in bilayer lipids, where this probe senses a more polar environment with respect to LAURDAN. Our results suggest the stabilization of the ground-state La conformation of the polar naphthalene moiety in the polar environment. Supported by grants from the National Institutes of Health (RR03155) and by CONICOR, SeCyT UNC, Fundacion Antorchas and CONICET, Argentina.