FLUORESCENCE EMISSION STUDIES ON 1-PHENYL-4-AROYL(AND ACYL)-1H-1,2,3-TRIAZOLES

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Triazole ring systems have been immensely studied for their biological activities as antibacterial agents. However, little is known about their photophysical properties. We have investigated the emission characteristics of synthesized 1-phenyl-4-aryl(acyl)-1H-1,2,3-triazoles in order to investigate the effect of varying arylic groups on fluorescence emission.

Fluorescence emission from 378 nm excitation yielded fluorescence quantum yields, $Q_f$, radiative lifetimes, $\tau_0$, fluorescence lifetimes, $\tau_f$, and fluorescence rate constants, $k_f$ values in the range of 0.001-0.016, 17-132 ns, 0.02-1.29 ns and (0.9-18.2)$\times$10$^5$ sec$^{-1}$, respectively, for seven 4-aryl(acyl) derivatives 1-phenyl-1,2,3-triazoles in chloroform solutions. Mesomeric effects are detected on fluorescence emission parameters. The strong $\pi$-electron donor of 5,10-dihydrocarbazolo[3,4-c]carbazole is found to quench fluorescence emission of triazoles and gives quenching rates of 7.7$\times$10$^{10}$ - 2.8$\times$10$^{12}$ M$^{-1}$s$^{-1}$. The high rates of fluorescence quenching, $k_q$, are attributed to a ground state complexation between 1,2,3-triazoles and the strong $\pi$-electron donor carbazolocarbazole. Mesomeric effects are seen to increase the fluorescence quenching rates. 1,2,3-Triazoles have shown intense solvatochromic absorbance shifts in n-hexane, chloroform and methanol. Absorbance shifts reaching 44 nm were observed from polar to protic solvents.
The strong \( \pi \)-electron donor 5,10-dihydrocarbazolo[3,4-c]carbazole quenches fluorescence emission of triazoles at \( 10^{-4} \) molar concentrations. The singlet energies of triazoles (75.7 kcal/mol) and carbazolocarbazole molecule (76.5 kcal/mol) are similar.

The rates of fluorescence quenching, \( k_q \), calculated from the Stern-Volmer plot (Figure) have values of \( 7.7 \times 10^{10} \) - \( 2.8 \times 10^{12} \) M\(^{-1}\)s\(^{-1}\). Overall high quenching rates, \( >10^{10} \) M\(^{-1}\)s\(^{-1}\), may be attributed to fluorescence quenching in ground state complexation between 1,2,3-triazoles and strong \( \pi \)-electron donor of carbazolocarbazole\(^{2,3}\).

![Stern-Volmer plot](image)

**Fig.** Stern-Volmer plot of fluorescence quenching of dihydrocarbazolocarbazole in presence of increasing 1-phenyl-4-(p-chlorophenyl)-1H-1,2,3-triazole, 1, concentrations (0-65.1)\( \times 10^{-6} \) m, in chloroform solutions.

**References**

