Substituent Effect on Luminescence of Novel Tetraarylimidazole Derivatives

Irina Mardaleishvili[1], Alexander Lubimov[1], Liubov Koltsova[1], Andrey Shienok[1], Peter Levin [2], Natalia Zaichenko[1]

[1]*N.N. Semenov Institute of Chemical Physics RAS, Moscow, Russian Federation*
[2]*N.M. Emanuel Institute of Biochemical Physics RAS, Moscow, Russian Federation*

E-mail : marli2007@yandex.ru

The purpose of this work is synthesis and investigation of molecules with multiresponsive luminescence for creation and further realization of multifunctional polymer materials with luminescence of different colors tuned by excitation wavelength change.
Several novel hydroxy-tetraarylimidazole derivatives with different substituents in 2-aryl ring were synthesized and investigated by spectral-luminescent methods in powder, different solvents, and polymer media.
Only one emission band with solvatochromic shift depending on the solvent polarity (470-454 nm) was observed for 1 and 2. Introduction of an electron – accepting substitient -- NO_2 group into phenyl ring in para-position to the OH group in 3 and 4 led to bathochromic shift of the emission band (490-510 nm) and appearance of additive emission bands with λ_{max} = 390-425 nm and 530-550 nm. Multiemissions arise from several species, their ratio depends on the solvent. So the different fluorescence (Fig.1) can be switched in solutions by changing the excitation wavelength. Whereas the position of shortwavelength emission bands is sensitive to pH, the position of the longest wavelength band is unchanged, but its intensity is lowering in basic media. For more detailed investigation and understanding the nature of emission bands, transient absorption measurements were performed in solutions of 1-4 and in polymer systems. The origin of observed emission bands will be discussed.
Compounds 1-4 were embedded in polymers by two ways -- during polymerization of acrylate oligomers and in polymer solutions. Polymer matrixes with 1 and 2 are characterized by luminescence with emission at 465-470 nm. Several emission bands of 3, 4 may be realized in some soft flexible polymers whereas in hard polymers only one emission band is observed, so the system may be considered as a switch of different luminescence by the excitation wavelength changing.

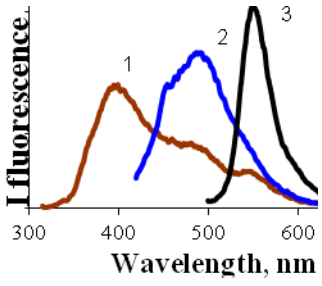
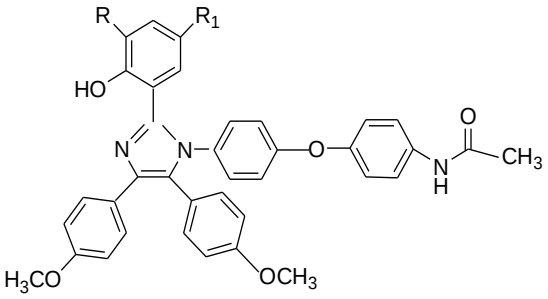


Figure 1. The emission spectra of 4 in ethanol, λ_{ex} = 305 nm (1), 400 nm (2) and 490 nm (3).



	R	R_1
1	H	H
2	OMe	H
3	H	NO_2
4	OMe	NO_2

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