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Synthesis and Fluorescence Property of A New Subphthalocyanine

Xiao Bing WANG*, Dai Hua TANG, Zhen ZHEN, Jian Cheng ZHANG, Xin Hou LIU

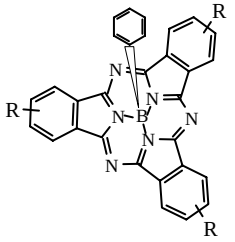
Institute of Photographic Chemistry, Chinese Academy of Sciences, Beijing 100101

Abstract: A new soluble subphthalocyanine was first prepared and its fluorescence property was investigated. It exhibited both S_1 and S_2 emissions, of which the quantum yields and the lifetimes were measured.

Keywords: Synthesis; subphthalocyanine; fluorescence; double-exponential function.

Recently, subphthalocyanines[1], a new type of phthalocyanine-like compounds and composed of three isoindoline units, were prepared for the synthesis of asymmetrical phthalocyanines. Their special structure (**Scheme 1**) and abundance of π-electrons make them possible to be candidates for functional materials. However, they were usually used as starting materials in synthetic reactions, its physical properties required further investigations.

Scheme 1. the schematic structure of substituted subphthalocyaninanoboron

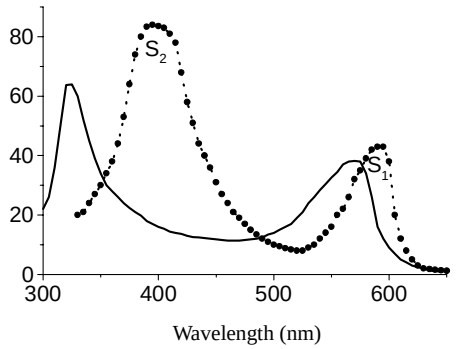


(R= t-BuCH2O-)

In this paper, (μ-phenyl) -tri (2, 2-dimethylpropoxy) –subphthalocyaninatoboron was synthesized according to literature method[2] with the yield of 72% and identified by MS, Elem. Anal., IR (MS: 730 *m/z*); Elem. Anal. Calc. C 73.97, H 6.44, N 11.51, Found: C 74.21, H 6.15, N 11.94; IR (selected data, cm^{-1}): 2950, 2865, 1582, 1458, 1399, 1365, 1262, 965, 741, 690). We measured the fluorescence and excitation spectra of the compound. The spectra were shown in **Figure 1** and the obtained values of quantum yield (ϕ_F) and lifetimes (τ) were listed in the legend. It exhibited the so-called S_1 and S_2 emission, as have been found commonly for alkoxy group-substituted phthalocyanines[3]. The S_2 emission peak at 393.2 nm is much broader than S_1 emission at 593.4 nm, and the Stoke's shift of the S_2 emission is very large, while that of the S_1 emission is smaller.

The quantum yields of both S_1 and S_2 are relatively small compared with corresponding phthalocyanine though the quantum yield of S_2 is higher than that of S_1.

Figure 1 Fluorescence (**…**) and excitation spectra (—) of the product in $CHCl_3$ (excited by 323.3 nm), ϕ_{F1}=0.013, τ=1.45 ns; ϕ_{F2}=0.059, τ_a=1.42 ns (44.2%), τ_b=10.8 ns (55.8%).



As for the S_2 emission, in order to obtain a good fit of the decay curve, a double-exponential function was used. Two components with 1.42 ns (44.2%) and 10.8 ns (55.8%) were required. The latter value was fairly larger for a singlet state, which indicated that the S_2 emission may be originating in the triplet state, such as π-π^*.

Acknowledgment

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