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PII: S0022-2313(17)31891-4  
DOI: <https://doi.org/10.1016/j.jlumin.2018.03.084>  
Reference: LUMIN15503

To appear in: *Journal of Luminescence*

Received date: 10 November 2017  
Revised date: 25 March 2018  
Accepted date: 27 March 2018

Cite this article as: Mehdi M. Irani, Farahnaz Nourmohammadian, Saeed Bastani, Farhood Najafi and Niyaz Mohammad Mahmoodi, Photophysical properties of novel functionalized fluorescent dyes based on diketopyrrolopyrrole and application in inkjet printing ink, *Journal of Luminescence*, <https://doi.org/10.1016/j.jlumin.2018.03.084>

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# Photophysical properties of novel functionalized fluorescent dyes based on diketopyrrolopyrrole and application in inkjet printing ink

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## Abstract

The novel fluorescent dyes based on diketopyrrolopyrrole materials were developed as a basic component for use in inkjet ink formulations. *N*-substituted DPP derivatives of ethyl formate and ethyl acetate (symmetric and asymmetric) were synthesized and characterized. Then, quantum chemical calculations were performed to investigate the observed changes in the photophysical properties of synthesized materials. Photophysical investigations of fluorescence dyes in various solvents and the effect of solvatochromism and the solubility of dyes in inkjet inks and solid state emission of dyes were used to select symmetric and asymmetric derivatives for application in inkjet formulation. In addition, the inkjet ink based on the symmetric *N*-substituted DPP derivatives of *N,N*-diethylformate and ethyl acetate was formulated. Inkjet inks were printed on polymeric substrate and their fluorescence were studied. The solubility of the asymmetric *N*-ethyl acetate dye in ink formulation was lower than symmetric derivatives due to stronger inter-particle interactions. From photophysical features of printed substrate, the final formulation based on symmetric ethyl acetate dye was performed for further investigation. The effect of concentration on the intensity of emission and also on the color properties (Lab) of formulation was studied. The optimum dye concentration of symmetric *N,N*-diethylacetate dye with highest fluorescent intensity was 0.3% wt in ink formulation. Finally, the symmetric ethyl acetate dyes formulation for security inkjet ink was performed.

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