Photoluminescence Properties of Dicarbonyl Containing Organic Molecules

G.D.K.V. Maduwantha[1,2]* and K. R. Koswattage[2]
[1]*Faculty of Graduate Studies, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka*
[2]*Department of Engineering Technology, Faculty of Technology, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka*
*infokaveendra@tech.sab.ac.lk

Recently, organic electronic materials emitting room temperature phosphorescence (RTP) has been studied heavily. The bases of the field depend on the molecule synthesis and characterization of new and superior variants. Benzil and benzil alike dicarbonyl containing molecules (molecules with two carbonyl (C=O)) plays an exciting role in such studies. The current study provides both fundamental and extended emission properties of a set of novel benzil derivatives, consists of a fluorinated monobenzil variant, a bisbenzil variant, and a non-fluorinated bisbenzil variant. Photoluminescence character is studied by time-resolved and steady-state photoluminescence spectroscopies at both room temperature as well at 77 K (in liquid nitrogen) accordingly. It was revealed that the molecules in focus are capable of emitting RTP. The variant with the most extended lifetime as well the highest emission amplitude was the monobenzil variant. The RTP lifetimes were estimated using both the time-correlated single-photon counting (TCSPC) method and 12-bit oscilloscope coupled with the third harmonic excitation light pulses from Nd:YAG laser. The recorded lifetimes for phosphorescence were 16.9 μs (by TCSPC)/17.5 μs (by oscilloscope) for monobenzil variant, 5.2 μs/5.2 μs for bisbenzil variant, and 18.8 μs/17.5 μs for fluorinated bisbenzil variant. Thus, we conclude that all three variants can emit RTP while monobenzil has more prolonged and intense emission from the triplet state, Also the fluorination in bisbenzil doesn't affect the exited triplets. Hence for efficient RTP materials bulky substituents in benzil framwork is recommended.

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