Protonable nitrogen-based heterocyclic chromophores for white light emission.

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In the context of the reduction of energy consumption, and taking into account that lighting accounts for ~20% of energy consumption worldwide, there is a great interest in research into new light emitting devices, particularly Light Emitting Diodes (LED), that consume less energy. White Organic LEDs (WOLEDs), first reported by Kido,[1] can now outperform incandescent light bulbs and even fluorescent tubes in terms of luminous efficiency. A good white-light emitter should be a 'warm' white, as defined by colour coordinates close to the Planckian locus around the equi-energy white point (x = 0.33, y = 0.33 in the *Commission Internationale de l'Eclairage* (CIE) 1931 diagram).[2]

A new strategy for WOLED fabrication has recently emerged that involves the use of only one emitting material with two forms of complementary colours, such as neutral/protonated species.[3]

During the past decade, we have described a large library of push-pull diazine chromophores.[4] When substituted by electron-donating fragments via π-conjugated linkers, these compounds are highly fluorescent and their emission properties are highly sensitive to external stimuli such as solvent polarity, pH, and metal cation complexation. Protonation of push-pull pyrimidine derivatives leads to a bathochromic shift in the absorption. Whereas the emission is often quenched upon protonation, methoxy-substituted pyrimidines generally exhibit a red-shifted emission.[5] However, it should be noted that methoxy-substituted compounds with high emission quantum yields require an extended π-conjugated bridge.[6] Some compounds of our library possess these requested specifications.[7] Recently we have extended this strategy to pyridine derivatives.[8]

In this communication, we will describe the emission properties of a mixture of neutral and protonated forms of these compounds both in solution and in thin films. The controlled protonation of these blue emitting dyes led to white photoluminescence (Figure 1).

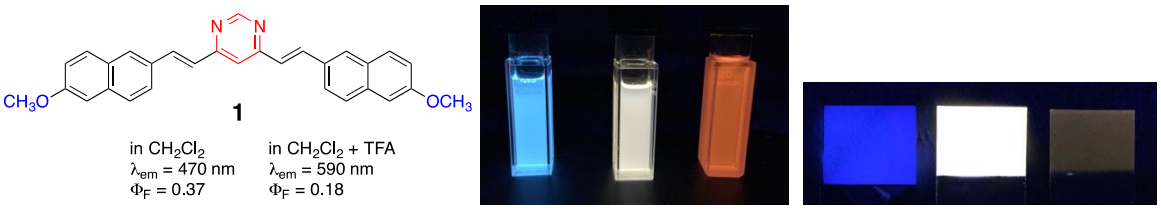

Figure 1. Chemical structure of **1** (left). Colours of CH_2Cl_2 solutions of **1** (middle) and polystyrene thin films doped with 1 wt% of **1** (right) in absence and the presence of 50 and 1000 equivalents of trifluoroacetic acid.

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