Efficient white light emission in solution, nanoparticles, gel and thin film employing porous organic polymer

Pragyan Pallavi, Sujoy Bandyopadhyay, Jesna Louis and Abhijit Patra*

Department of Chemistry, IISER, Bhopal, MP, India
E-mail: pragp@iiserb.ac.in

Abstract:
White light emitting (WLE) materials have drawn significant attention because of its multi-stimuli responsive properties and applications in lighting and display devices.[1] The urge of a cost-effective and environmentally benign material for solid state white light emission with high quantum efficiency is in increasing demand. The typical WLE material is designed using the combination of multichromophoric components or a single molecular material with multifunctional emitters.[2] Herein, the porous organic polymer was used for encapsulation of fluorescent dyes to generate efficient white light emission. Tetraphenylcyclopentadiene (TPDC) and benzothiadiazole (BZ) based solution processable ultra-microporous polymer (TPDC-BZ) was synthesized having BET surface area of 610 m^2 g^{-1}. The polymer exhibited strong yellow fluorescence in tetrahydrofuran and was employed as a scaffold for encapsulation of blue and red emitting dyes to tune the emission color towards white. White light emission in four different forms, solution, hybrid nanoparticles, gel and transparent thin films were achieved (Fig. 1).[3] The efficient energy transfer in nanoparticles led to a high fluorescent quantum yield of 35%, which was further elucidated by time-resolved emission spectra analysis.The present study paves the way for novel optical applications of solution processable porous organic polymers as potentially useful light emitting materials.

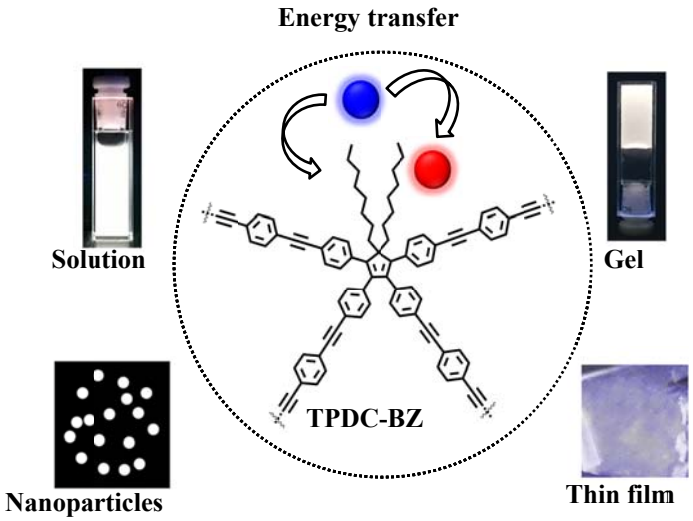

Figure 1: Schematic illustration of white light emission in solution, nanoparticles (NPs), gel and thin film employing soluble conjugated porous organic polymer (TPDC-BZ), blue and red emitting fluorescent dyes.

References:

1. Findlay, N. J.; Bruckbauer, J.; Inigo, A. R.; Breig, B.; Arumugam, S.; Wallis, D. J.; Martin, R. W.; Skabara, P. J. *Adv. Mater.* **2014**, *26*, 7290.
2. Sun, C. Y.; Wang, X. L.; Zhang, X.; Qin, C.; Li, P.; Su, Z. M.; Zhu, D. X.; Shan, G. G.; Shao, K. Z.; Wu, H.; Li, J. *Nat. Commun.* **2013**, *4*, 2717.
3. Pallavi, P.; Bandyopadhyay, S.; Loius, J.; Deshmukh, A.; Patra, A. *Chem. Commun.* **2016**, DOI: 10.1039/C6CC08903H.