Super-quenching effect of optoelectronically important bipolar fluorescent probe by metal nanoparticles

[1*]Virupaxappa. S. Betageri, [1]Latha M.S, [1]G.H. Pujar and [1] Harishkumar M. R.

Department of Chemistry and Department of Physics

[1] GM Institute of Technology, Davanagere 577 006, Karnataka, India

Abstract

In the present investigation, we have designed and synthesized a novel molecule 2-(4-((E)-2-(5-((E)-4-(5-(4-tert-butylphenyl)-1,3,4-oxadiazol-2-yl)styryl)thiophen-2-yl)vinyl) phenyl)-5-(4-tert-butylphenyl)-1,3,4-oxadiazole (TVP)based on Donor-π-Acceptor strategy by employing Wittig reaction. The structural integrity of the new compound was characterized by ^{1}H NMR, ^{13}C NMR, HR-MS and FT-IR analysis. In addition, super-quenching effect and surface energy transfer (SET) have been studied using this optoelectronically important TVP molecule as efficient donor and gold metalnanoparticles (Au MNPs) as excellent acceptors employing steady-state and time resolved spectroscopic techniques. The size and distance dependant SET between TVP and Au MNPs was explored. It is demonstrated that quenching efficiency increases as the size of Au MNPs increases from 40 to 53 nm. The super-quenching effect and nonradiative energy transfer were analyzed using Stern–Volmer plots. The impact of the present investigation about super-quenching effect of the Au MNPs can be exploited for biosensing applications that demand high degree of sensitivity, if conjugated to the biomolecules.

Keywords: gold nanoparticles, SET, solvatochromism, fluorescence quenching, bipolar molecule, oxadiazole.