Optical properties of a D- π-A Type Dye

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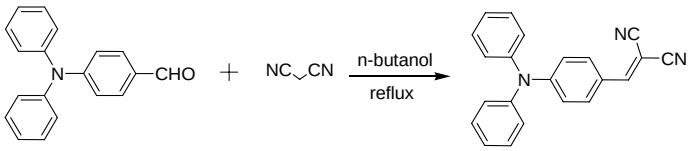
1. Introduction

Triphenylamine as building blocks is a popular donor group and was applied widely in designing functional molecules and rapidly growing in material chemistry[1-4].

In this study, we designed and synthesized the donor-acceptor (D-A) type fluorescent dye with triphenylamine as donor group. The structure of triphenylamine is proper-like. Therefore, its amorphous properties is prominent and this properties is very useful in designing and synthesizing functional polymer and fabricating devices. Triphenylamine is also very easy to be functionalized and the functional group, such as aldehyde, bromo and iodine, can be used to connect with other functional molecules by condensation reaction, Suzuki coupling reaction or other well-know reaction. Its commercial availability in high purity and lower price is also popular to scientist. Malononitrile was chosen as the acceptor unit. The donor-bridge-acceptor type dye usually can produce impressive optical optical-physical properties. The two donor and acceptor is also suitable to be applied in the synthesis of small functional organic molecule. Small organic functional molecule has its own unique advantages, such as excellent solubility, especially amorphous small organic functional molecules. And this area is nee to be explored and developed. Now its application in mental-organic compound is rapidly and widespread in its self assembly, photoluminescence, chiral organocatalyst and ingraft with nano-materials.

2. Experiments

Its synthesis was according to literature method with modification[5].



Scheme 1.

3. Results and Discussion

The UV spectra and fluorescent spectra of cyanovinylene were measured in hexane, dichloro- methane, toluene and DMF as shown Fig. 1. Besides DMF, the absorption spectra in hexane, toluene and dichloromethane have a little difference. The maximum absorption in solutions of hexane, toluene and dichloromethane are 428nm, 440nm and 443nm, respectively. It is interesting that the maxmium absorption in DMF shows a broad absorption from 290nm to 350nm.

Their fluorescene emission spectra were shown in Fig. 2. In the four different solvent, large different emission was found. The maximum emission were 441nm (DMF), 490nm (hexane), 546nm (toluene) and 612nm (CH_2Cl_2), respectively. The difference between them are 49nm, 56nm and 66nm, respectively. And the fluorescence emission showed light blue(DMF), blue (hexane), light green (toluene) and yellow(CH_2Cl_2).

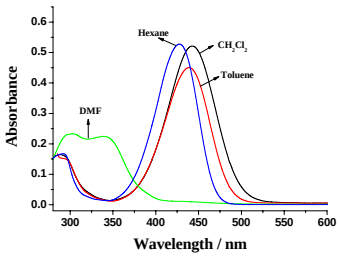


Fig. 1. Absorbance spectra in hexane, toluene, dichloromethane and DMF solutions(1.0×10-5M).

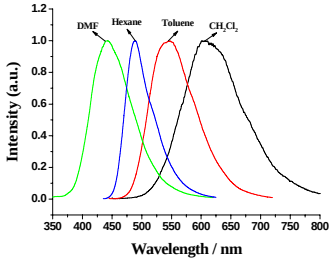


Fig. 2. Fluorescence emission in hexane, toluene, dichloromethane and DMF solutions(1.0×10-5M).

4. Conclusion

Obvious solvent dependent properties of emission were found for cyanovinylene triphenylamine in several typical solvent. The properties were studied, including UV-visible spectroscopy, fluorescence spectroscopy and theoretical calculated geometry. The results correspond to the experimental results.

5. References

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