

Photophysical Properties of 3,3'- Diethylthiacarbocyanine Iodide (DTCI) in Deep Eutectic Solvents (DES) and Molecular Solvents

Nur Fathiah Mohd Zin, Mohd Azizi Nawawi

Structured Abstract

Background: Molecular solvent uses in processes where hydrogen bonding plays an important role. Recent study shows the researchers identify novel solvents for environmental benefits like DES which have advantages over molecular solvent. DES is environmentally friendly and derived from renewable resources. This study used DTCl as rotors because of its strong absorption and emission with high molar absorptivity. The purpose of this study is to measure the fluorescence signal of DTCl in the prepared solvents.

Methods: For preparation DES, Choline chloride (ChCl) in a solid form was mixed with different solvents for reactions. Urea and malonic acid involve in solid reaction, while ethylene glycol and glycerol involved solid-liquid reaction. The mixtures were stirred until clear solutions formed at 45°C. After that, they were dried in a vacuum oven at 50°C for 8 hours and stored in desiccator. Next, for preparation of stock solution, DTCl stock solutions were made by mixing 0.038g of DTCl with 5ml of methanol, resulting in a concentration of 17.49mM. For UV-Vis, we added 3 μ l in 3000 μ l of various molecular solvents. The concentration for UV-Vis was 17.49 mM while lower concentration 5.83mM for fluorescence. We added 1 μ l in 3000 μ l of each solvent and we did characterize DESs by using FTIR and NMR spectroscopy.

Results: For result, we got peak emission and excitation spectra DTCl in molecular solvent and DESs. In molecular solvent, the highest absorbance is 435.48A which PEG400 while the lowest is DI water which 6.54A. Based on studies, glycerol should have the highest absorbance due to highest viscosity and DCM should have lowest absorbance because lowest viscosity. Temperature dependence one of the factors can impact the result of fluorescence spectra. Viscosity is often temperature dependent, and changes in temperature can impact the sensitivity of molecular rotors. For DESs, ChCl/Malonic acid is the highest emission same as the literature. The relationship between fluorescence intensity and viscosity value were expressed by Forster Hoffman equation.

Conclusion: In conclusion, measurement of photophysical characteristic of DTCl in prepared solvents indicate this dye as probe for determine fluorescence intensity of solvents. The Intensity of molecular rotors for fluorescence emission was dependant on viscosity of solvents.

Keywords: DTCl, DES, solvent

*Correspondence: 2020846824@student.uitm.edu.my

Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia