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# Behaviour of 4-(*N*,*N*-dimethylamino)benzonitrile in Molecular Solvents and Deep Eutectic Solvents

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**Structured Abstract**

**Background:** Molecular solvents (MS) are extensively used in research and development industries. However, they have drawbacks, like toxicity, high volatility, and high polarity. Recently, green solvents have been found to be safer solvents. Deep eutectic solvents (DES) are green solvents that promise low volatility, non-toxic, non-hazardous, and biodegradable. However, these green solvents have relatively high viscosity. Thus, DMABN, a fluorescent probe, is used in studying the viscosities and polarity of DES and MS.

**Methods:** The DESs were synthesized by mixing different mole ratios, grinding, heating at 60 °C for 2 to 4 hours until colourless, vacuum-drying at 50 °C, P = 10mPA for 8 hours, and cooled. The DESs were characterized by Fourier Transform InfraRed (FTIR) and Nuclear Magnetic Resonance (NMR) spectroscopy. To study the behaviours of DMABN in DESs and MS, UV-visible and Fluorescent spectroscopy were done by spiking DMABN stock into DES and MS. The fluorescent intensity of DMABN was then correlated with DES's and MS's viscosity using the Förster-Hoffman equation.

**Results:** This study shows two absorption peaks by UV-visible spectroscopy: locally excited (LE) and charge transfer (CT) in polar solvents; meanwhile, only the CT peak is shown in non-polar solvents. The presence of LE and CT absorption peaks in DESs were shown to be like molecular polar solvents, which may indicate that DESs were polar solvents. By fluorescent spectroscopy, DMABN emitted the highest emission in non-polar solvents, and red-shifted emission occurred in polar solvents. In DESs, the emission intensity of DMABN increased as the DES's viscosity increased, showing its dependence on the viscosity. The results from the correlation graph show that log viscosity increased non-perfect linearly to log intensity in LE and CT emissions of DES. In MS, the graph increased non-perfect linearly in polar solvents and decreased non-perfect linearly in non-polar solvents.

**Conclusion**: In conclusion, DMABN exhibited a complex dependency of fluorescent emission intensity on both solvent polarity and viscosity. Based on the findings, DMABN is more sensitive to polarity than viscosity.

**Keywords:** DMABN, DES, MS, Fluorescent Emission Intensity, Viscosity-Polarity

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