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Examination of the robustness of viscosity sensitive molecular rotors against chemical modification

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Molecular rotors, a special class of compounds which form twisted intramolecular charge transfer complexes (TICT), have dual deexcitation processes – intramolecular rotation and fluorescence emission. Molecular rotors exhibit a quantum yield that is sensitive to changes in solution viscosity; this property makes molecular rotors highly suitable for optical measurements of viscosity. The goal of this study was to test the idea that increasing the chain length of the molecular rotor increases its viscosity sensitivity. Molecular rotors of varying chain length were selected for experimentation; DCVJ, a thoroughly studied molecular rotor, was chosen as the control. Mixtures of differing ratios of ethylene glycol and glycerol were created to vary viscosity. Fluorescence emission intensity data for the six molecular rotors was measured with a Jobin Yvon Fluoromax-3 spectrofluorometer. Logarithmic graphs of fluorescence intensity versus viscosity were created and displayed a linear relationship with regression values exceeding 0.99. However, the slopes for the various molecular rotors were not significantly different. The results demonstrate that increasing the molecular rotor’s chain length does not significantly increase viscosity sensitivity, indicating that additional elements can be attached to the molecular rotor without changing its functionality.