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Title:	Synthesis and Characterization of Red Emitting TICT Rotors for Monitoring of Mitochondrial Microenvironment
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Abstract:	<p>Fluorescent molecular rotors (FMRs) based on electron donor acceptor systems showing twisted intramolecular charge transfer (TICT) upon photoexcitation are planned to be synthesized and investigated in this work. Such TICT based rotors show fluorescence properties that are sensitive to any change in its surrounding environment factors such as solvent temperature, polarity, viscosity, pH and so on. Most importantly, such FMRs can be very effectively used as temperature and viscosity sensors and can be utilized to study the temperature and viscosity of cellular microenvironments, a challenging problem to address otherwise. The hurdles faced during the establishment of ratiometric temperature/viscosity molecular probes for bio-imaging and sensing applications together with the propagation of red emitting rotors with photostability to match the tissue optical window and large Stokes shift for negligible autofluorescence. One of the most significant cellular organelle that often gets targeted for disease diagnosis is the mitochondria. The mitochondrial microenvironment parameters such as temperature, viscosity, pH often provide opportunities to investigate mitochondrial morphology and functions. Due to the presence of negative potential in the mitochondrial inner membrane, the positively charged cations get attracted towards it due to charge attraction hence increasing the mitochondria uptake of these molecules. The most commonly used cationic groups that target mitochondria are triphenylphosphonium (TPP), pyridinium salts and quaternary ammonium salts. In this project, red emitting donor-spacer-acceptor (D-π-A) molecular rotors (ADA-1 and ADA-2) based on TICT are planned to be synthesized in which BODIPY and BDT act as acceptor and donor respectively in a A-D-A configuration. The choice of an electron donating thiophene (p) spacer will ensure the red or near infrared (NIR) emission of these rotors making them suitable for bio- imaging. These molecules will be functionalized with a mitochondria targeting group (quaternary salt of piperidine moiety) such that the emission sensitivity of these rotors to temperature and viscosity can be efficiently utilized to study and monitor mitochondrial microenvironments through ratiometric temperature sensing and viscosity sensing experiments. Owing to their multi-stimuli responsive emission behaviour, these rotors are thus expected to emerge as valuable fluorescent molecular rotor probes to monitor the levels of biologically relevant indicators in cells and organisms.</p>
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