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Title:	Design of supramolecular scaffolds to address ferroelectric and multiferroic properties at room temperature and polymer chains with multiple secondary structures
Authors:	DEEPAK
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Abstract:	<p>The growing demand for wearable and flexible electronics has led to the development of soft electronics. Recent advances in supramolecular chemistry have tremendous potential for developing soft electronics. This work aims to address the challenges associated with anchoring functional units to supramolecular scaffolds without compromising their self- assembled structure and translating solution structures into bulk materials. Several supramolecular scaffolds based on benzene 1,3,5-tricarboxamide (BTA) cores with naphthalene diimides (NDI) at the periphery were synthesized to exploit synergistic interactions between H-bonding and charge-transfer (C-T) complexation. Among different hydrocarbon spacer lengths, the six-carbon spacer was found optimal for achieving self-assembled hierarchical structures. The introduction of C-T complexation to the BTA-C 6 -NDI 3 scaffold with electron-rich guest molecules (pyrene) at the periphery led to the formation of an organogel and the solution structure effectively translated into the bulk state while preserving ordered morphology. A highly polar bulk structure composed of a tris-amide group of BTA core showed ferroelectric switching behavior, piezoelectric, and pyroelectric response at room temperature (<math>T_c \sim 47^\circ\text{C}</math>). Next, organic multiferroic material was addressed using a similar supramolecular strategy by introducing another functional element (TEMPO radical) into the polar BTA scaffold. The resulting scaffold [BTA-(NDI-TEMPO) 3 ] behaves as organic multiferroic material at room temperature. The device fabricated from the C-T mediated scaffold displayed a remarkable magnetoelectric coefficient (<math>\alpha = 220 \text{ mV/Oe-cm}</math>) in the bulk state and acts as potential material for magnetic and pyroelectric energy harvesting at room temperature. Later, a segmented polymer (helix 1 -helix 2 -helix 1 ) with multiple secondary structures was also demonstrated to fulfill a slightly different purpose. The initial helical structure of a triblock copolymer chain was transformed into a helix 1 - column-helix 1 structure using C- T interaction at the middle block. These triblock copolymers consist of multiple secondary structures across a single polymer chain</p>
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