Title:	Observation of helical self-assembly in cyclic triphosphazene-based columnar liquid crystals bearing chiral mesogenic units
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Abstract:	Nowadays, intensive research has focused on the design and synthesis of function-integrated smart materials resulting from the spontaneous self-assembly of appropriately chosen functional molecules. Working in this direction, we have synthesized a new series of non-conventional, chiral columnar liquid crystals (Col LCs), where the cyclotriphosphazene core is surrounded by cholesterol-based Schiff base dimeric units. Cholesterol, which is covalently bound to the two-ring Schiff base core via a flexible spacer of varying length and parity, has been premeditatedly incorporated to induce handedness in the Col fluid macrostructure. These investigations, using a number of complementary techniques, clearly reveal the influence of the length of the spacer, rather than the parity, on the symmetries of 2D lattices resulting from the intrinsic Col assemblies of the synthesized compounds. The different Col assemblies were further confirmed through detailed electron density mapping and small-angle/wide-angle X-ray scattering (SAXS/WAXS) studies. As conceived, bulky cholesterol, which can induce molecular chirality, directs the molecular assemblies in a helical manner in individual columns. The handedness (helicity) of the Col LCs has been confirmed via temperature-dependent chiroptical measurements where the intensity of the peak in the circular dichroism (CD) spectra increases with a decrease in temperature, implying that the core–core correlation within the columns and, thus, the proximity of the chromophores varies with the temperature. Notably, upon exposure to hydrochloric acid (HCl) these novel materials exhibit fluorescence “turn-on” characteristics in their solid (as synthesized) state that can be visualized instantly by the naked eye where the color change occurs with a low detection limit of 5.6 μM.
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