

Chirality Control in Columnar Supramolecular Aggregates

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Among various strategies of endowing columnar liquid crystals with special functions, we have pursued the achievement of well-organized helical organizations,¹ as the expression of supramolecular chirality, which can be controlled and switched by molecular as well as external chiral factors.

Chiral columnar mesophases, organized within well-defined bidimensional lattices –hexagonal (Col_h) or rectangular (Col_r)–, are attained from H-bonded tetrameric or rosette-type complexes of a melamine derivative and non-mesomorphic V-shaped acids. An orthogonal non-covalent synthetic strategy is proposed for the formation of unusual mesogenic cores that promote the appearance of columnar mesomorphism by combining the π -stacking tendency of the melamine and the lateral interaction between V-shaped molecules.²

Chirality transfer from the molecule to the mesophase occurs when stereogenic centers are present in the acid counterparts. Furthermore, chiral information of Circularly Polarized Light (CPL) is transferred to the Columnar Organization through photoaddressable azobenzene groups.³ This process enables switching of the supramolecular chirality of the columnar arrangement in a reversible manner by illumination with CPL of opposite handedness. More than that, achiral columnar systems can be biased towards a chiral supramolecular organization upon illumination with the corresponding CPL. In any case the chiral photoresponse achieved upon illumination is stable for long periods of time.

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The work was supported by the CICYT (projects MAT2003-07806-CO2-01 and MAT2005-06373-CO2-01), FEDER (EU), and the DGA.