Hydrogen Bonded Supramolecular Mesogens

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Mesophase morphologies of supramolecular mesogens are presented involving single, double and triple hydrogen bonding between complementary molecular species. Semiperfluorinated fragments were incorporated into the constituent molecules to enhance structure formation tendencies by the fluorophobic effect.
One-chain and two-chain partially fluorinated benzoic acids form single hydrogen bonded complexes in binary mixtures with *trans*-1,2-bis(4-pyridyl)ethylene (1). A smectic A phase is induced for mixtures of the one-chain acids and the bispyridyl-ethylene. On cooling, the SmA phases transform into a smectic C phase. 2:1 binary mixtures of the dipyridine with the two-chain acids display columnar mesophases with either oblique or hexagonal 2D lattice symmetry depending on the chain length of the acid.
Semiperfluorinated diamino-1,3,5-triazines (2) form double hydrogen bonded heterodimers with partially fluorinated aromatic acids. The dimeric supermolecules exhibit a rectangular columnar phase with a centered *c2mm* plain group or a columnar mesophase with oblique lattice symmetry. Heterodimers of a non-fluorinated triazine analogue with two-chain fluorinated benzoic acids display a rectangular columnar phase with non-centered *p2gg* space group. The two-dimensional lattice symmetries are governed by the number of fluorinated tails of the acid as well as by the substitution pattern of the triazine component.
A two-chain semiperfluorinated diamino-1,3,5-triazine was found to form mesomorphic complexes with one equivalent of complementary pyrimidine derivatives capable for triple hydrogen bonding. Heterodimers with alkoxy substituted barbiturates and orotic acid ester display a hexagonal columnar mesophase whereas the equimolar complex with a partially fluorinated barbiturate exhibits a cubic phase.
The mesophase formation of the investigated binary mixed systems is due to the segregation of incompatible molecular fragments. Thereby, the cross-sectional areas of the microsegregated regions largely determine the mesophase type.

References

(1) A. Kohlmeier, D. Janietz, *Liq. Cryst.* **2007**, *34*, 65.
(2) A. Kohlmeier, D. Janietz, S. Diele, *Chem. Mater.* **2006**, *18*, 1483.