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MS15-P21 Shape and confinement effects of various terminal siloxane groups and C₆₀ on supramolecular interactions of hydrogen-bonded bent-core liquid crystals

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To investigate the shape and confinement effects of the terminal siloxane groups and C₆₀ on the self-assembled behavior of molecular arrangements in hydrogen-bonded (H-bonded) bent-core liquid crystal (LC) complexes, several H-bonded bent-core complexes with string-, ring-, ball-, and cage-like siloxane termini (i.e., linear siloxane unit -Si-O-Si-O-Si-, cyclic siloxane unit (Si-O)₄, ball-shaped C₆₀, and silsesquioxane unit POSS, respectively) were synthesized and investigated. By X-ray diffraction measurements, different types of mesophases were controlled by the shape effect of the string- and cage-like siloxane termini, respectively. In addition, the confinement effect of various terminal siloxane groups and C₆₀ (accompanied by increasing the numbers of attached H-bonded bent-core arms) resulted in higher transition temperatures and the diminishing of mesophasic ranges (even the disappearance of mesophase). Moreover, AFM images showed the bilayer smectic phases were aligned to reveal highly ordered thread-like structures by a DC field. By spontaneous polarization measurements within the mesophasic ranges, different ferroelectric and anti-ferroelectric behavior were observed, which can be manipulated by the molar ratios of these binary mixtures. Finally, the electro-optical performance of these H-bonded bent-core LC complexes could be optimized through binary mixtures of proton donors and acceptors with various molar ratios.

Keywords: hydrogen-bonded, bent-core, liquid crystal, ferroelectric, anti-ferroelectric