

Mesomorphism of branched PPI-G1 dendrimers

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Synthesis and the liquid crystalline properties of the family PPI-G1 dendrimers are presented. Dendrimers are composed with the dimeric mesogenic side-branches possessing stilbene and acetylene moieties (Fig. 1). Depending on the number of terminal chains grafted onto the peripheral mesogen, they exhibit either columnar phases in which the column cross-section is made of a few molecules or smectic phases. The dendrimers and their acid precursors have similar mesophase behavior, showing that the column structure is determined mainly by the tendency to separate mesogenic cores and alkyl chains. The column diameter is determined by the number of terminal alkyl chains. For larger number of chains higher curvature of the surface separating mesogenic cores and melted terminal chains is necessary, which is realized by reducing the diameter of the column. Some of the reported here compounds show a richer polymorphism than usually observed for dendrimeric compounds. X-ray studies evidenced that two materials form phases with three dimensional structures (Fig. 2), but with liquid-like short range order within the columns. Such 3D structure can be attributed to helical arrangement of the molecules in the column. Studied acid precursors form frequently, apart of hexagonal columnar phase, also phases with rectangular or oblique crystallographic lattice.

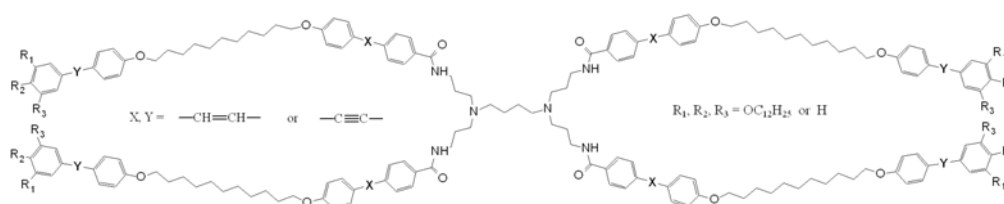


Figure 1. General structure of studied compounds

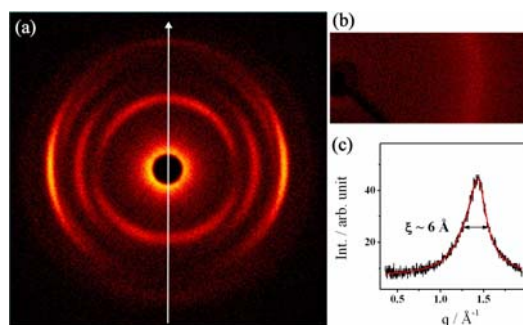


Figure 2. Low (a) and wide (b) angle x-ray diffraction pattern for partially aligned sample of dendrimeric compound forming 3D structure. Arrow in (a) indicates column axes direction. Existence of non-equatorial signals (not perpendicular to column axis direction) proves long-range structure in the column. (c) Integrated intensity from pattern (b) vs. wavevector q . The signal is centred at 4.4 \AA , the correlation length obtained from the signal width at half maximum is $\sim 6 \text{ \AA}$.