H-Bonded Banana-Shaped Liquid Crystals Containing Bis-Pyridyl Acceptors

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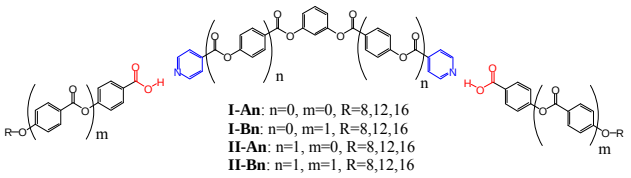
In order to investigate the molecular organization and of double H-bonded bent core mesogens (Fig. 1) and structure of the mesophases, powder X-ray diffraction (XRD) measurements were carried out in the mesogenic temperature ranges of all H-bonded compounds. Synchrotron powder X-ray diffraction (XRD) measurements were performed at beamline BL17A of the National Synchrotron Radiation Research Center (NSRRC), Taiwan, where the wavelength of X-ray was 1.334431 Å. The XRD data were collected using imaging plates (IP, of an area = 2 × 40 cm^2 and a pixel resolution of 100) curved with a radius equivalent to a sample-to-image plate distance of 280 mm, and the diffraction signals were accumulated for 3 min. The powder samples were packed into a capillary tube and heated by a heat gun, whose temperature controller is programmable by a PC with a PID feedback system. The scattering angle theta was calibrated by a mixture of silver behenate and silicon.



I-An: n=0, m=0, R=8,12,16
I-Bn: n=0, m=1, R=8,12,16
II-An: n=1, m=0, R=8,12,16
II-Bn: n=1, m=1, R=8,12,16

Figure 1. Chemical structures of four double H-bonded mesogens with different rigid-core numbers.

XRD investigation of double H-bonded structures. The powder XRD measurements of mesophase determinations of double H-bonded mesogens are inspected and summarized in Fig. 1 and Table 1. A single reflection peak of XRD patterns in the mesophases of complexes **I-A12** and **I-A16** are demonstrated at d1 = 32.5 Å and 40.9 Å in small angle region, individually and broad diffuse peaks at 4.5 Å in wide angle area, given the existence of an ordinary smectic phase in the double H-bonded series **I-An** containing five-ring bent-cores to indicate lamellar order exists in the mesophases. Moreover, by the extension of bent-core to seven-rings in double H-bonded complexes I-B12 and I-B16 could one sharp reflection peaks at d1 = 33.5 Å and 37.6 Å, individually and a large tilt angle (θ) of 56 ° be acquired averagely from the XRD pattern also proved lamellar order exhibition.

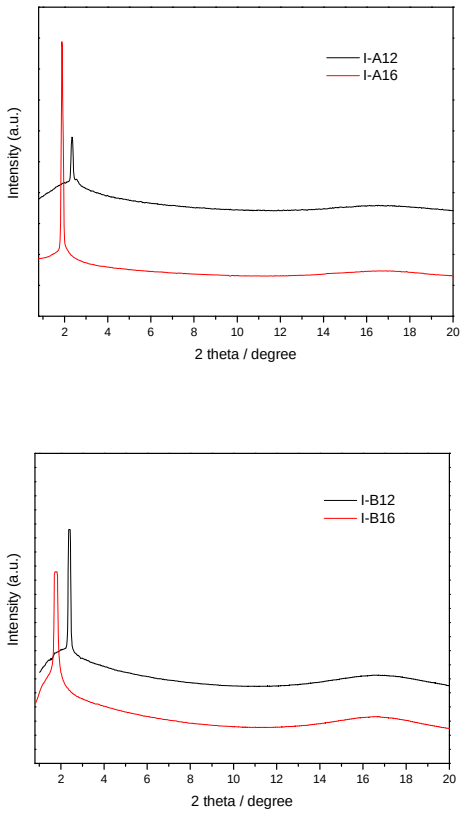


Figure 2. XRD measurements of four H-bonded complexes.

Table 1. XRD data results of four H-bonded complexes

Comp.	Measured Spacing of repeat unit / nm	Theoretical length of repeat unit / nm	Tilt angle / °
I-A12	32.5	L = 46.2	45.3 °
I-A16	40.9	L = 50.9	36.5 °
I-B12	33.5	L = 61.1	56.7 °
I-B16	37.6	L = 66.6	55.6 °