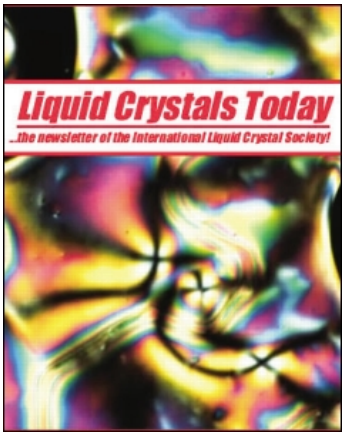

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Smectic Mesophases Formed by Banana-Shaped Molecules

S. Diele[a]; G. Pelzl[a]; W. Weissflog[a]
[a] Facbereich Chemie, Institut für Physikalische Chemie, Martin-Luther-Universität Halle-Wittenberg, Halle, Saale, Germany

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Nomenclature of Liquid Crystals

One of the signs of the maturing of a new area of knowledge is a heightened discussion and awareness of nomenclature, conventions and labels. In emerging sciences, the facts are often in dispute or open to different interpretations, and so premature attempts to categorize and standardize will only serve to confuse and delay real understanding. Liquid crystal science is now of an age when the attention of its practitioners is being drawn to considerations of nomenclature. Indeed in 1997 IUPAC (International Union of Pure and Applied Chemistry) issued provisional recommendations concerning the definition of basic terms and symbols for liquid crystals. Members of the International Liquid Crystal Society have become involved with the preparation of a final document, which hopefully will be generally accepted and followed by scientists in the field. Some of the initial recommendations have already been reported in the new *Handbook of Liquid Crystals*, published in 1998 [1], so the process of formalising the nomenclature of liquid crystals has begun.

Much of liquid crystal terminology is no longer contentious, although many will recall the problems that had to be resolved concerning the designation of certain smectic phases. However in the dynamic science of liquid crystals, new phases and effects continue to be reported and characterized, so the issue of nomenclature cannot be closed, and there are many topics that will attract the attention of scientists eager to bring apparent order to the terminology for liquid crystals. In this section we publish two contributions to the debate on nomenclature for emerging topics. In attempting to categorize new phenomena, it is a '*sine qua non*' that the structures or effects are characterized and understood. Without this condition an excursion into nomenclature is worthless.

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Smectic mesophases formed by banana-shaped molecules

S. Diele, G. Pelzl and W. Weissflog

Facbereich Chemie, Institut für Physikalische Chemie, Martin-Luther-Universität Halle-Wittenberg 06099 Halle (Saale), Germany.

Liquid crystals composed of bent molecules exhibit smectic-like phases including undulated or two-dimensional ones which are unlike the smectic phases fromed from normal calamitic molecules [1]. These phases are not miscible with any smectic phases of calamitic compounds, which emphasizes their distinctness, although it must be remembered that immiscibility is not a criterion for a new phase type. Until the true character of these phases is established, it has been proposed (*Workshop on Banana-shaped Liquid Crystals*, December 1997, Berlin) that the phases be labelled with the code letters B_1...B_7 in the sequence of the their discovery.

In order to facilitate the assignment of mesophases of new synthesized liquid crystals formed by banana-shaped molecules we present for all new smectic-like phases some reference substances (in table 1) and also the structural features and some properties of these phases (as far as known) (see table 2). For some selected banana-shaped compounds the bending angle in the liquid-crystalline state could be determined using NMR measurements [3-6]. It follows from these measurements that in all B phases studied the bending angle is between about 100° and 135°; lower angles favour the formation of nematic phases, while higher angles result in normal smectic phases [5]. A general description of the possible arrangement of bent-shaped molecules within smectic layers [10], and their switching characteristics has been presented [8] .

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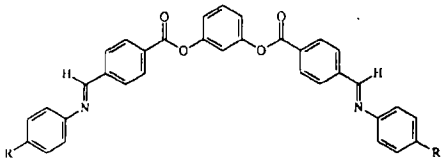
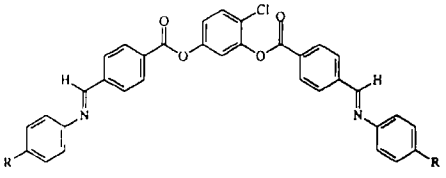
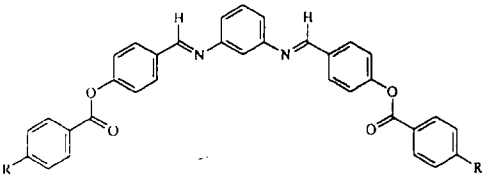
Table 1



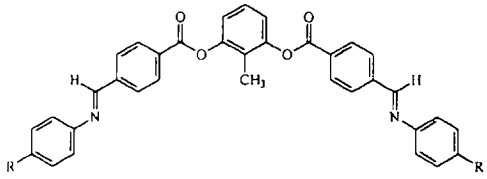
1 R: OC6H13 B4* 143.6 B3* 159.1 B1 173.4 I [1, 2]
2 R: OC8H17 Cr 158 (B4 146) B3 162 B2 175 I [1, 2, 3]



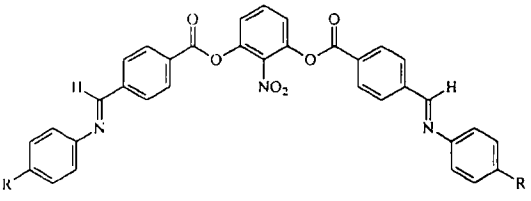
3 R: OC12H25Cr 115 B2 142 I [4, 5]



4 R: OC6H13O Cr 134 B1 142 B6 148 I [5]
5 R: OC8H17O Cr 115 B1 134 I [3, 5]

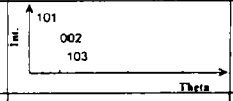
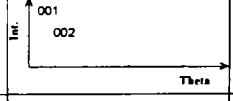
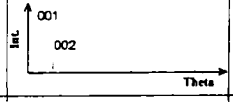
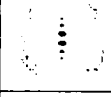
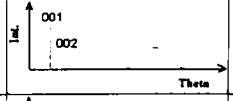
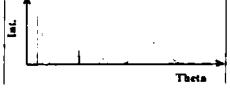


6 R:OC8H17 Cr 161 B5 165 B2 172 I [6]



7 R: OC8H17 Cr 116 B7 177 I [7]
*B3 and B4 designate crystalline phases [3]

Table 2

phase	compounds	ref.	electrooptical switching	X-ray non-oriented	oriented	remarks
B_1	1, 4, 5	1, 2, 3, 5, 9	–			2D structure, tilt of the molecules; mosaic texture; order parameter: 0.82..0.85
B_2	2, 3, 6	1 – 6, 8	+ switching from antiferroelectric → ferroelectric			tilt of the molecules [8], chiral smectic layers; antiferroelectric structure; fan-shaped or schlieren texture; order parameter: ~ 0.8 (temperature – independent)
B_5	6	6	+ switching from antiferroelectric → ferroelectric			tilt of the molecules, chiral smectic layers; antiferroelectric structure; fan-shaped or schlieren texture; order parameter: ~ 0.82 (temperature – independent)
B_6	4	5	–			tilt of the molecules, intercalated structure fan-shaped or schlieren texture; order parameter: ~ 0.82 (temperature – independent)
B_7	7	7	–		up to now no orientation with common methods	probably 2D struture; screw-like growth of nuclei and texture features indicate a helical superstruture