Polycatenar mesogens derived from benzo[1,2-d:4,5d']bisthiazole.

Facultad de Ciencias Químicas, Departamento de Química Orgánica, Universidad de Concepción, Casilla 160-C, Concepción, Chile.
*endiaz@udec.cl

Keywords: liquid crystal, polycatenar, benzobisthiazole.

INTRODUCTION

Polycatenar liquid crystals have been known since 1985. They consist of a long rod-like rigid core ending in two half-disc moieties. The molecular architecture of such hybrid mesogens, situated between rod-like and disc-like mesogenic compounds, allows a rich polymesomorphism. On the other hand, efficient light-emitting diode (LED) materials derived from heterocyclic benzobisazoles have been studied. An efficient π-stacking and strong intermolecular interaction were attributed to some novel physicochemical and mechanical properties observed in such materials. In this work, new mesogenic polycatenar have been prepared, with the incorporation of benzo bisthiazole.

RESULTS AND DISCUSSION

The synthesis of tetracatenar and hexacatenar mesogen with 2,6-bisphenylbenzo[1,2-d:4,5d']bisthiazole as rigid central unit has been described in the scheme 1 and 2. The hexacatenar mesogen (I) has been obtained from esterification reaction between 2,6-bis(hydroxyphenyl)benzo[1,2-d:4,5d']bisthiazole (1) and 3,4,5-trisdecyloxybenzoyl chloride (2) in presence of DMAP which behaves as catalyst and base agent (scheme 1).

Scheme 1. Synthesis of bisthiazole mesogen (I) with ester group, [transition temperatures (°C): Cr 90 Colx 132 I].

In the case of tetracatenar mesogen (II), the preparation is based on coupling reaction between 2,5-diamino-1,4-benzenedithiol dihydrochloride and 4-[5-(3,4-bis(decyloxy)phenyl)-1,3,4-thiadiazol-2-yl]benzoyl chloride (3), using pyridine as base agent (scheme 2).

Scheme 2. Synthesis of bisthiazole mesogen (II) with thiadiazole unit, [transition temperatures (°C): Cr 76 Colx 97 I].

These products have shown thermotropic liquid crystalline properties with enantiotropic behavior. The columnar mesophase has been determined by textural observations using thermal microscopy under a polarizing optical microscope (Figure 1).

Figure 1. Optical micrographs (magnification: x20) I) Columnar phase at 100 °C of hexacatenar mesogen with function ester, and II) Columnar phase at 92 °C of tetracatenar mesogen with thiadiazole unit.

The columnar phase in these materials is explained by some self-assembled molecules generating disc-shaped aggregates. The self organization of these aggregates exhibit columnar structure due to π-stacking effect between rigid central units of 2,6-bisphenylbenzo[1,2-d:4,5d']bisthiazole.

CONCLUSION

The molecular design proposed and obtained through the synthesis described in this work has been a success, allowing to reach new polycatenar liquid crystals based on 2,6-bisphenylbenzo[1,2-d:4,5d']bisthiazole unit.

ACKNOWLEDGEMENTS

This work was supported by FONDECYT (Grant 1100140), “Dirección de Investigación” of the University of Concepción and CONICYT (postgraduate scholarship).

REFERENCES