

Liquid Crystals based on carboxylic acids, amines and nitro compounds derived from 1,3,4-thiadiazole.

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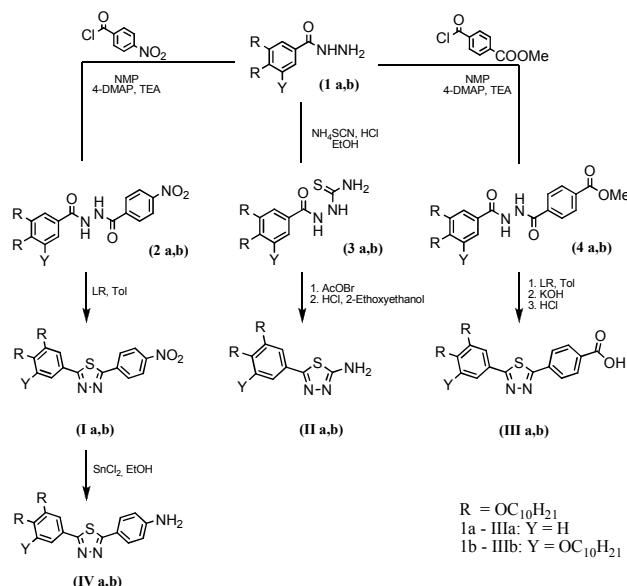
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Keywords: Liquid Crystals, 1,3,4-thiadiazole, Columnar LC.

INTRODUCTION

Heterocycles are of great importance in thermotropic liquid crystals.¹ Mesogens containing 1,3,4-thiadiazole have significant lateral dipole moments, wide mesomorphic temperature ranges, chemical stability and altering the molecular shape, leading to different liquid crystal behaviours.² Moreover, the generation of columnar liquid crystals exhibit a molecular organization that allows the transport of energy or charge. In this abstract, we report the synthesis, characterization and mesomorphic properties of novel carboxylic acids (**III a,b**), amines (**II a,b** and **IV a,b**) and nitro compounds (**I a,b**) derived from 1,3,4-thiadiazole displaying liquid crystal properties. The synthetic route is shown in scheme 1.

RESULTS AND DISCUSSION



Scheme 1. Synthesis of mesogens **I a,b** - **IV a,b**. LR = Lawesson Reagent.

For compounds of the series (**I a,b**) the results are mixed, the compound **1a** do not show liquid crystal properties, Contrary to this compound **1b** shows columnar liquid crystal properties. Both compounds of series (**II a,b**) and

(**III a,b**) display mesomorphic properties, in each case a columnar mesophase was observed under optical polarizing microscopy (see figure 1). For compounds of series (**III a,b**) the columnar mesophase was identified by x-ray diffraction as hexagonal columnar phase. These mesomorphic properties of acids (**III a,b**) are attributed to intermolecular hydrogen bonding between two molecules of acid which in turn dimerize giving a polycatenar mesogen. The series (**IV a,b**) also show mesomorphic properties, when compared with the analogous (**II a,b**), we found that additional benzene ring in (**IV a,b**) produces higher melting temperatures and lower clearing temperatures (see table 1).

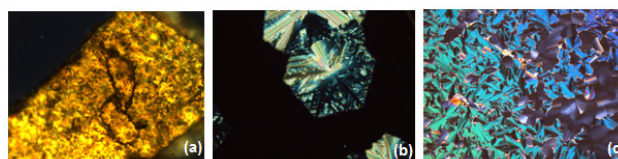


Figure 1: Optical micrographs (Magnification: 40x) of (a) **IVb** at 40 °C; (b) **IIIa** at 166 °C; (c) **IIb** at 136 °C

Table 1. Transition temperatures [°C]. Col_h = hexagonal columnar mesophase, Col_x = unidentified columnar mesophase, RT = Room temperature

	a	b
I	Cr 174 Iso	Cr 68 Col _x 72 Iso
II	Cr 83 Col _x 120 Iso	RT Col _x 164 Iso
III	Cr 144 Col _h 235 Iso	Cr 124 Col _h 132 Iso
IV	Cr 92 Col _x 103 Iso	Cr 43 Col _x 59 Iso

CONCLUSION

In conclusion, the 1,3,4-thiadiazole reported here showing good mesomorphic properties. The best results were obtained with molecules capable of generating intermolecular hydrogen bonding.

ACKNOWLEDGEMENTS

This work was supported by FONDECYT (Grant 1100140), CONICYT (Postgraduate Scholarship) and "Dirección de Investigación" of the University of Concepción.

REFERENCES

- Seed, A., *Chem. Soc. Rev.*, **2007**, 36, 2046-2069.
- Han, J.; Chang X. Y.; Zhu L. R.; Wang Y. M.; Meng J. B.; Lai S. W. Chui S.S.Y., *Liq. Cryst.*, **2008**, 35, 1379-1394.