

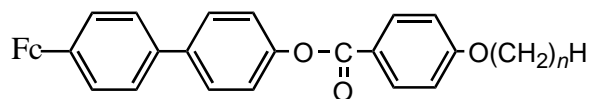
LIQUID CRYSTALS BASED ON FERROCENYLBIIPHENYL AND FERROCENYLTERPHENYL

M. V. Makarov¹, D.A.Lemenovskii¹, A. E. Bruce², M. R. M. Bruce², V. P. Dyadchenko¹

¹*M. V. Lomonosov Moscow State University, Chemistry Department, Leninskie Gory, 119992 Moscow, Russian Federation. E-mail: dyadchenko@org.chem.msu.ru*

²*University of Maine, Chemistry Department, Aubert Hall, Orono, Maine, ME 04469-5706, USA. E-mail: abruce@maine.edu.*

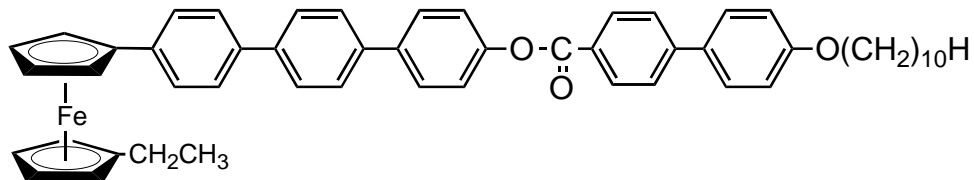
4,4'-Disubstituted-1,1'-biphenyl is a widely used building-block for the construction of calamitic liquid crystals (LC). Molecules of these LC's have rod-like shapes and contain different groups on opposite ends of a biphenyl system. The nature of these groups exerts a great influence on the properties of mesophases. In particular, introduction of ferrocene, which is a bulky, easily polarizable moiety, often drastically changes mesomorphic behavior of LC's. The structural and liquid crystalline properties of ferrocenomesogens has recently been reviewed [1].



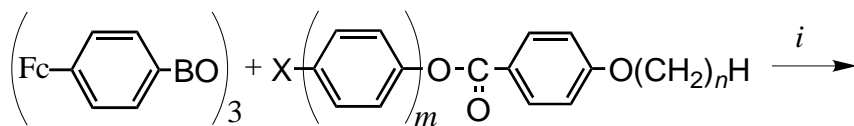
1a, $n = 8$

1b, $n = 10$

4'-Ferrocenyl-1,1'-biphenyl-4-yl 4-alkoxybenzoates $\text{Fc}-(\text{C}_6\text{H}_4)_2-\text{OC}(\text{O})-\text{C}_6\text{H}_4-\text{O}-\text{C}_n\text{H}_{2n+1}$ ($n = 8, 10, 12$) (**1a-c**) representing a new class of ferrocene-containing thermotropic mesogens with nematogenic properties were prepared [2]. Two approaches were used for the synthesis of these mesogens: reaction of 4'-ferrocenyl-1,1'-biphenyl-4-ol with 4-alkoxybenzoylchlorides and cross-coupling of *tris*(4-ferrocenylphenyl)-boroxine (**2**) with the corresponding halobenzene (see Scheme on next page). Cross-coupling was also applied for the synthesis of terphenyl-containing mesogens $\text{Fc}-(\text{C}_6\text{H}_4)_3-\text{OC}(\text{O})-\text{C}_6\text{H}_4-\text{O}-\text{C}_n\text{H}_{2n+1}$ ($n = 10, 12$) (**4a,b**) and $(\text{C}_2\text{H}_5\text{C}_5\text{H}_4)\text{Fe}[\text{C}_5\text{H}_4-(\text{C}_6\text{H}_4)_3-\text{OC}(\text{O})-\text{C}_6\text{H}_4-\text{O}-\text{C}_{10}\text{H}_{21}]$ (**5**). The latter compounds also form nematic phases. The mesophases formed by the mesogens **4a,b** exist in broader thermal intervals than mesophases of their biphenyl-containing counterparts **1b,c**. The most pronounced mesomorphism was displayed by compound **5**: its nematic phase exits between 141 and 253 °.



Scheme 1



2

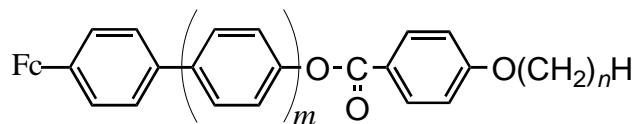
3a, $m = 1$, $n = 12$, $\text{X} = \text{I}$

3b, $m = 1$, $n = 10$, $\text{X} = \text{Br}$

3c, $m = 1$, $n = 12$, $\text{X} = \text{Br}$

$i = \text{DMF}, \text{H}_2\text{O}, \text{K}_2\text{CO}_3,$

$3.3\text{-}4.2\% \text{Pd}(\text{PPh}_3)_2\text{Cl}_2, 65\text{ }^\circ\text{C}$



	m	n	Yield, %
1c	1	12	75
4a	2	10	43
4b	2	12	44

References:

[1] Imrie, C.; Engelbrecht, P.; Loubser, C.; McClelland, C. W. *Appl. Organomet. Chem.* **2001**, *15*, 1-15.

[2] Makarov, M. V.; Lemenovskii, D. A.; Bruce, A. E.; Bruce, M. R. M.; Dyadchenko, V. P. *Liquid Crystals*, submitted.