

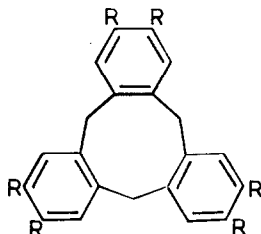
NOVEL MACROCYCLES FROM 2,5-DIMETHYLTHIOPHEN AND RELATED SYSTEMS

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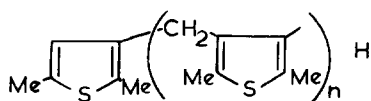
The action of formaldehyde and strong acids on veratrole and various related compounds has been shown to give the tribenzocyclononene (1)¹ together with small amounts of the analogous tetramer².



(1)

Several workers³ have demonstrated unequivocally that the trimer exists solely in the 'crown' conformation and that this conformation is stable up to 200°. Thus the methylene protons are non-equivalent in the n.m.r. spectrum, showing geminal coupling of 14 Hz.

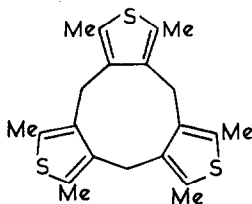
While repeating the literature procedure⁴ for the preparation of the dithienylmethane (2a) by chloromethylation of 2,5-dimethylthiophen in the



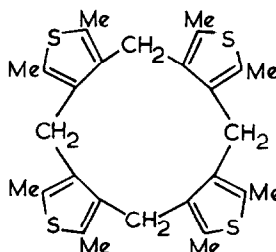
(2)

- a; n = 1
- b; n = 2
- c; n = 3

presence of zinc chloride, we isolated by chromatographic work-up the reported products (the dimer (2a) and trimer (2b)) together with two further minor products. The first, m.p. 244-5°, formed in very small quantities as white needles from ethyl acetate and proved to be the cyclic trimer (3) on the basis



(3)



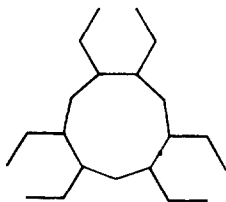
(4)

of analysis, n.m.r. (τ (CDCl₃): 7.73s(18H, Me's) and 6.46s(6H, CH₂'s)) and mass spectrum (M⁺, m/e 372.1036; C₂₁H₂₄S₃ requires 372.1041). The second, m.p. 190-3° (7%) was the linear tetramer (2c) as indicated by its analysis and mass spectrum (M⁺, m/e 484).

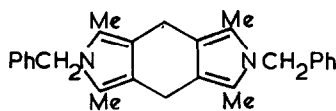
The cyclic trimer became the major product (42%) by a change of the reaction conditions. Thus an equimolar mixture of 2,5-dimethylthiophene and formaldehyde in acetic acid was added slowly dropwise to a refluxing acetic acid solution of zinc chloride containing a little mineral acid. After reaction the cooled solution was filtered and the precipitate sublimed under high vacuum to give the trimer (3) at 200° and a small quantity of the tetramer (4) at 300° (m.p. > 370°, M⁺, m/e 496.1384. C₂₈H₃₂S₄ requires 496.1387)

The cyclic trimer is surprisingly different from its benzenoid analogues (1) in its conformational mobility. Thus the methylene protons appear as a singlet in both chloroform and benzene solution and the signal is unchanged even at -60° indicating that a rapid conformational flipping occurs. This mobility is perhaps a reflection of the wider angle distended by the 3,4-thiophenic bonds (68°) compared to that of the benzenoid system (60°) and the steric interaction of the methyl groups which would tend to favour a 'saddle' conformation.

Desulphurisation of thiophens often leads to a useful synthesis of hydrocarbons. When the trimer (3) was boiled with an excess of Raney nickel in benzene, virtually quantitative conversion to 1,2,4,5,7,8-hexaethylcyclononane (5) was observed (b.p. 142-5°/1.3mm; Kugel Rohr) suggesting that this approach



(5)



(6)

with suitable thiophens could offer a useful synthesis of substituted medium-size ring hydrocarbons.

Attempts to extend the cyclic oligomerisation to 2,5-dimethylpyrrole and 2,5-dimethylfuran were without success even when tetrahydrofuran replaced the acetic acid and only intractable tars were formed. However, from 1-benzyl-2,5-dimethylpyrrole⁵ was isolated the unstable dimer (6), m.p. 214-6°(d) [N.m.r. τ (CDCl₃): 7.92s(12H, Me's), 6.51s(4H, C-CH₂-C's), 5.06s(4H, N-CH₂'s) 3.18m(2H, Ar) and 2.88(3H, Ar). M.s.; M⁺, m/e 394].

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