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Synthesis of anti -[2.2] (2,6) Benzothiazolophane : The first example of [2.2]Benzofused Heterophane.

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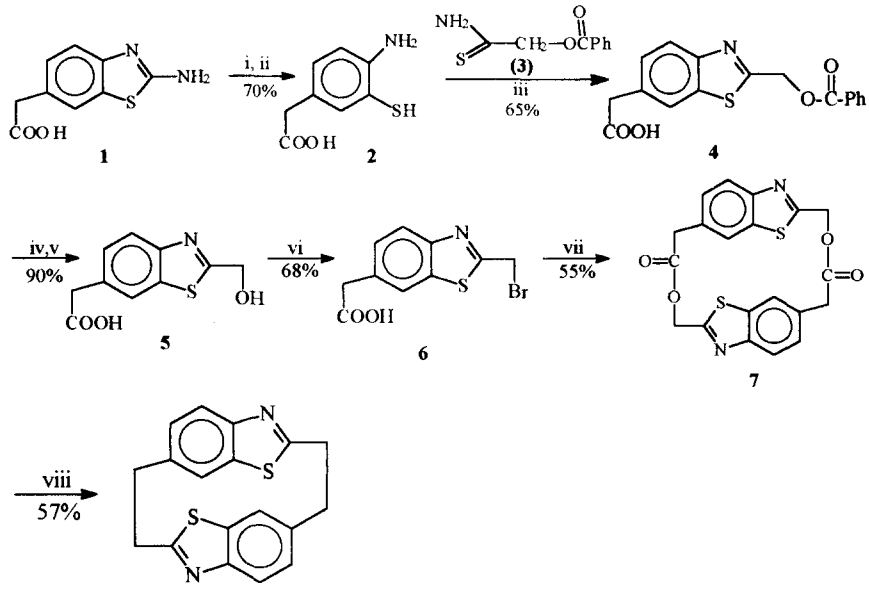
Abstract: Synthesis of the first [2.2] benzofused heterophane **8** is described via photodecarboxylation of bislactone **7**. Dynamic ^{1}H NMR studies suggest that **8** is conformationally rigid whereas **7** is conformationally mobile on the NMR time scale.

A variety of [2.2] heterophanes consisting of 6π-acceptor and 6π-donor heteronuclei have been synthesised and their structural, spectral and dynamic properties are well documented[1]. Though, heterophanes are of continuing interest[2], surprisingly there exists todate no report on 10π[2.2]-benzofused heterophanes in the literature. In connection with our interest in the conformational analysis of heterophanes[3], we now wish to describe synthesis of the first example of [2.2] benzofused heterophane, namely anti -[2.2] (2,6) benzothiazolophane **(8)**[4]. One of the main objectives to synthesize **8** was to study and compare its conformational behaviour with known heterophanes.

Synthesis of **8** starts with 2-amino-6-mercaptobenzene acetic acid **(2)** which was readily prepared by base hydrolysis of the known **1**[5] followed by acidification under cold condition. The acid catalyzed condensation of **2** with benzyloxythioacetamide **(3)** as the carboxylic acid equivalent[6] furnished **4** in good yield. Deblocking of the benzoate group in **4** with NH_4OH led to hydroxy acid **5**. Since attempts to effect direct lactonization of **5** failed under a plethora of conditions, we resorted to nucleophilic halide displacement methodology towards **7**. For this purpose, **5** was transformed into bromo acid **6** by treatment with 47 % HBr in acetic acid. Of the many methods tried for lactonization of **6,** the Regen's protocol[7] proved much superior giving 55 % yield of bislactone **7** , mp. 290-292°C, IR (1728 cm^{-1}), m/e 410 (M^+). Finally, photodecarboxylation of **7** under irradiation with high pressure Hg discharge lamp afforded the target molecule **8** as a colourless solid in 57 % yield, mp. 245-250 °C, m/e 332 (M^+).

The bislactone **7** shows free ring inversion in its dynamic ^{1}H NMR since the singlets at δ 3.70 (CH_2-COO-) and δ 5.45 (-CH_2-OCO-) retained their singlet character from room temperature down to -55°C (CD_2Cl_2 ,200 MHz). This observation is in accordance with other four C-atom bridged phanes, such as [4.4] paracyclophane which is also reported to be a mobile molecule[8]. The benzothiazolophane **8** revealed for its bridge methylenes a complex AA'BB' multiplet (δ3.2-3.62) which showed no change upto 150 °C (DMSO-d_6,200MHz)in its ^{1}H NMR spectrum. Thus, **8** can be considered as conformationally rigid and its energy barrier to ring inversion can be estimated upward of 20kcal/mol in analogy to conformationally immobile [2.2] (2,5) thiopheno - and thiazolophanes[3a,9].



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Reagents: i)50% KOH,Δ,N_2 ,80 h . ii) 0-5°C conc. HCl. iii) $HOCH_2CH_2OH$,80-85°C,7h iv)NH_4OH,60-65°C,12h. v)0-5°C,conc.HCl vi)47% HBr in AcOH,Δ,10 h. °C°Δ vii)Anhyd.K_2CO_3,cat.CTAB,dry THF,Δ,10 h viii)dry CH_3OH,Hanovia 450(W),N_2 ,6h.

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