SYNTHESIS OF A NOVEL CLASS OF CONDENSED 1,2-THIAZINE-5-OXIDES.
CYCLOADDITION REACTION OF N-ARYL-4H-5,7a-EPOXYISOINDOLINES WITH
N-SULPHINYLAMINE

Dipak Ranjan Borthakur, Dipak Prajapati, and Jagir Singh Sandhu
Division of Drugs and Pharmaceutical Chemistry,
Regional Research Laboratory, Jorhat 785 006, India

Abstract — N-Sulphinylaniline (2) reacts readily with N-aryl-4H-5,7a-epoxyisoindolines (1) to give a novel class of condensed 1,2-thiazine-5-oxides (3) in good yields.

Diels-Alder reaction constitutes a powerful synthetic tool for the synthesis of a variety of polycyclic organic compounds. In the recent years the inverse electron demand Diels-Alder reaction has attracted much attention and is of continuing interest in the synthesis of complex heterocycles as well as natural products. In this context N-sulphinylanilines are typical heterodienophiles and in few cases are reported to react with azadienes as well as alkenes. In case of alkenes only bridged alkenes like norbornenes are found to be reactive. Here we wish to describe an interesting example of inverse electron demand Diels-Alder reaction employing N-sulphinylaniline and N-aryl-4H-5,7a-epoxyisoindolines (1) as dienophilic partners affording us a novel class of condensed 1,2-thiazine-5-oxides (3) in good yields.

N-Aryl-4H-5,7a-epoxyisoindolines (1) were prepared according to our earlier reported procedure and were reacted with N-sulphinylaniline (2) in equimolar quantities in dry benzene. The reaction mixture was stirred for 1 h and then kept at ambient temperature for 48 h, the removal of solvent and usual workup gave a white crystalline solid (3a) mp 248-250°C (dec.) in 70% yield.

The molecular formula C_{22}H_{24}N_{2}O_{3} of (3a) was determined by high resolution mass spectrometry in which molecular ion showed at m/z 396.1524 (100%) (calculated value 396.1508) and other major fragments at 380 (28%), 367 (24%).
\[ \text{O} \quad \text{CH}_2 \quad \text{NH} \quad \text{R} \quad \xrightarrow{\text{Br} \quad \text{Br}} \quad \text{O} \quad \text{N} \quad \text{R} \]

(1)

(2)

\[ \text{R} \quad \text{N} \quad \text{S} \quad \text{O} \quad \text{N} \quad \text{S} \quad \text{O} \]

(3)

(4)

<table>
<thead>
<tr>
<th>R</th>
<th>( \text{Mp} \ (^\circ C) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{C}_6\text{H}_4^- \text{OC}_2\text{H}_5(p) )</td>
<td>248 - 250 (dec.)</td>
</tr>
<tr>
<td>( \text{C}_6\text{H}_4^- \text{OCH}_3(p) )</td>
<td>235 - 237 (dec.)</td>
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<tr>
<td>( \text{C}_6\text{H}_4^- \text{CH}_3(p) )</td>
<td>&gt; 275</td>
</tr>
<tr>
<td>( \text{C}_6\text{H}_4^- \text{Cl}(p) )</td>
<td>258 - 260 (dec.)</td>
</tr>
<tr>
<td>( \text{C}_6\text{H}_4^- \text{Br}(p) )</td>
<td>268 - 270 (dec.)</td>
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</table>
The IR (KBr) spectrum showed a band at 1075 cm\(^{-1}\) indicating the presence of \(-\text{S}=\text{O}\) and other typical absorption at 3190 cm\(^{-1}\) corresponds to \(-\text{NH}\) group. The \(^1\text{H NMR (100 MHz, TFA)}\) \(\delta\): 1.45 (3H, t), 2.20-2.80 (2H, m), 3.40-5.00 (10H, m) and 6.80-7.70 (8H, m, aromatic) consistent with the structure (3a). Similarly were prepared compounds (3b-e) in 61-70% yield and their characteristics are recorded in the Table.

**Table : Physical Data of 1,2-Thiazine-5-oxides (3a-e)**

<table>
<thead>
<tr>
<th>Compd.</th>
<th>React. time</th>
<th>Yield</th>
<th>*Molecular formula</th>
<th>MS (M(^+))</th>
<th>(\nu_{\text{max}}) (KBr) cm(^{-1})</th>
<th>(^1\text{H (100 MHz, CF}_{3}\text{COOH)})</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a</td>
<td>48 h</td>
<td>70</td>
<td>(\text{C}<em>{22}\text{H}</em>{24}\text{N}<em>{2}\text{O}</em>{3})</td>
<td>396</td>
<td>3190,1075</td>
<td>1.45(3H, t), 2.20-2.80 (2H, m), 3.40-5.00 (10H, m) and 6.80-7.70 (8H, m, aromatic).</td>
</tr>
<tr>
<td>3b</td>
<td>50 h</td>
<td>65</td>
<td>(\text{C}<em>{21}\text{H}</em>{22}\text{N}<em>{2}\text{O}</em>{3})</td>
<td>382</td>
<td>3200,1075</td>
<td>2.15-2.75 (2H, m), 3.45-5.05 (11H, m), 6.85-7.80 (8H, m, aromatic).</td>
</tr>
<tr>
<td>3c</td>
<td>48 h</td>
<td>66</td>
<td>(\text{C}<em>{21}\text{H}</em>{22}\text{N}<em>{2}\text{O}</em>{2})</td>
<td>366</td>
<td>3210,1065</td>
<td>1.60 (3H, s), 2.40-2.90 (2H, m), 3.30-4.75 (8H, m), 6.90-7.80 (8H, m, aromatic).</td>
</tr>
<tr>
<td>3d</td>
<td>65 h</td>
<td>61</td>
<td>(\text{C}<em>{20}\text{H}</em>{19}\text{N}<em>{2}\text{O}</em>{2}\text{S}Cl)</td>
<td>386</td>
<td>3200,1070</td>
<td>2.30-2.85 (2H, m), 3.50-5.10 (8H, m), 6.85-7.65 (8H, m, aromatic).</td>
</tr>
<tr>
<td>3e</td>
<td>66 h</td>
<td>68</td>
<td>(\text{C}<em>{20}\text{H}</em>{19}\text{N}<em>{2}\text{O}</em>{2}\text{SBr})</td>
<td>431</td>
<td>3250,1075</td>
<td>2.35-2.91 (2H, m), 3.53-5.05 (8H, m), 5.90-7.70 (8H, m, aromatic).</td>
</tr>
</tbody>
</table>

*The microanalyses of these compounds were in satisfactory agreement with the expected results (C \(\pm\) 0.43, H \(\pm\) 0.30, N \(\pm\) 0.26).*

**ACKNOWLEDGEMENT**

The authors are thankful to Dr. Toshio Honda of Hoshi University, Japan for the mass and PMR spectra of one of our samples. One of us (ORB) thanks the Council of Scientific and Industrial Research, New Delhi for the award of a Junior Research Fellowship.
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   b) D. Prajapati, Ph. D. Thesis, Dibrugarh University, Dibrugarh, India,
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   c) The furfuryl-N-arylamines were available to us in high yields following
      the procedure reported by N. Singh, J. S. Sandhu and S. Mohan,

6. a) G. Kresze, A. Maschke, R. Albrecht, K. Bederke, H. P. Patzschke,
   b) A. Michaelis, Ber., 1891, 24, 745.
   c) G. Kresze, A. Maschke, R. Albrecht, K. Bederke, H. P. Patzschke,

7. The formation of regioisomer (4) was observed 5 - 10% vide tlc and in one
   case i.e. (3e) the regioisomer separation was effected to isolate (4e) in
   10% yield mp 225 - 227°C (dec.). The 1H NMR (400 MHz, CDCl3) of (3e) and
   (4e) was clearly distinctive and supporting the regioisomers. In (3e) the
   bridge head proton showed a doublet at δ 4.5 while in (4e) this proton
   shifted downfield and showed at δ 4.7. In both the cases it was a clean
   doublet showing no coupling with ring junction proton Ha which proved the
   endo configuration of the later.

Received, 23rd May, 1986