Poly-phenylene-quinonedimine as a Possible Conducting Liquid Crystal

H. K. Hall, Jr.
Chemistry Department
University of Arizona
Tucson, AZ 85721

Reproduction in whole or in part is permitted for any purpose of the United States Government.

This document has been approved for public release and sale; its distribution is unlimited.
Part 1.


c-i) Not Applicable.

Description

The synthesis of stable electrically conducting, fabricable polymers of known structure represents an important goal of current polymer science. It seems to us that conductive, processable, and stable materials of defined structure should not be beyond the reach of the modern synthetic polymer chemist.

Our approach has been to utilize a wide variety of polycondensation reactions to see whether they are useful for the synthesis of potentially conducting, stable, processable polymers. Polycondensation routes are preferred because they will lead to polymers of rational, known structure. Standard techniques of polymer chemistry such as copolymerization, use of unsymmetrical monomers, and introduction of "softening" substituents can be used to enhance processability. Further, the extended para structures preferred for conductivity may also lead to liquid crystal behavior, another potential tool for fabrication.
We have chosen condensation polymers containing nitrogen in the main chain as the focus of our work. Aniline Black is the prototype of conducting nitrogen-containing polymers. This nitrogen is expected to be useful as a handle for processing and doping as well as aiding in the synthesis of these new conjugated polymers.

d. **Significant Results**

1. We synthesized two new families of multiazopolyanyl esters and formals. Dipheno1s containing from one to three p-phenyleneazo links were synthesized by organic chemistry methods and condensed with diacid chlorides or with methylene chloride. Liquid crystal behavior was observed for several of these polymers.

   The polymers were found to be moderately electron-accepting (n-type). No p-type conduction could be found by doping with iodine (T. Kuo).

2. Highly branched "starburst" aromatic polyamines were synthesized by repetitive condensation reactions. They were doped with iodine to form semiconducting materials (D. Polis).

3. Condensation of N-ethylcarbazols with diethyl squarate and squaryl dichloride gave a new class of condensation polymers. These were not conductive even when doped with iodine (Yen Chen).

e. **Brief Plans**

We plan to synthesize polymers consisting solely of p-phenyleneazo links by oxidative coupling of aromatic chamines (T. Kuo).

Work on "starburst" polymers will be continued using aliphatic nitro compounds for greater reactivity (D. Polis).

Our anthraquinone polyimine work will be extended to other types of quinones (Dr. Yen Chen).
Nitrenium ion polymerization will be examined as a route to polyaromatic amines (Dr. Yen Chen).

Part 2.

a. Expended:

<table>
<thead>
<tr>
<th></th>
<th>Salaries</th>
<th>Operations</th>
<th>Travel</th>
<th>Capital</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/1/85 to 8/31/86</td>
<td>34,611.21</td>
<td>9,696.33</td>
<td>593.00</td>
<td>9,846.38</td>
<td>54,746.92</td>
</tr>
<tr>
<td>Budget:</td>
<td>38,108.00</td>
<td>6,515.00</td>
<td>800.00</td>
<td>5,500.00</td>
<td>50,923.00</td>
</tr>
</tbody>
</table>

b. Current telephone number: (602) 621-6325/6326