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# SYNTHESIS OF 2-ARYL-3-PHENYLINDONES AND A NEW SIMPLE ROUTE TO PENTAPHENE

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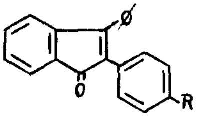
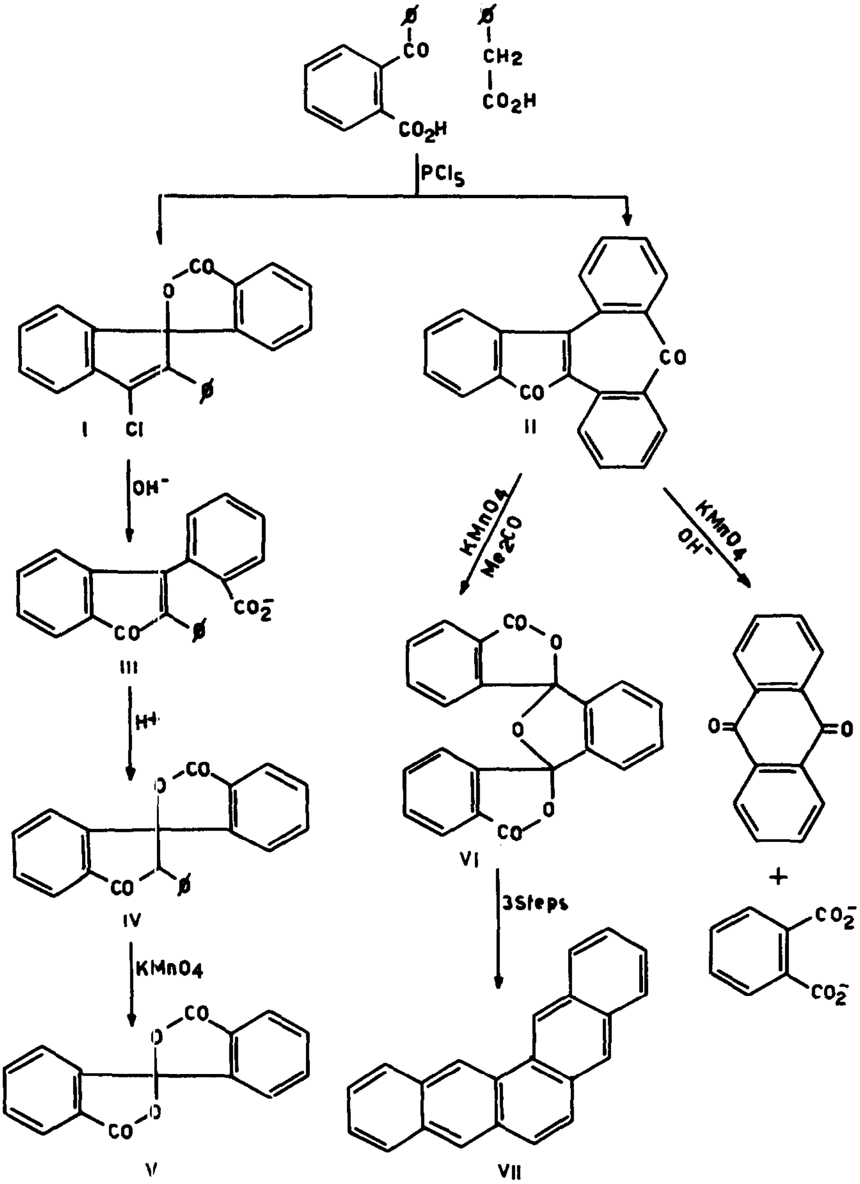
One of the oldest syntheses[1] of 2,3-diphenylindone involves the reaction between $\alpha,\alpha$-dichlorodiphenylmethane and methyl phenylacetate. A modification of this method, involving the heating at 220° of equimolar quantities of $\alpha,\alpha$-dichlorodiphenylmethane and a <u>para</u>-substituted phenylacetic acid chloride gave the following indones:

| Indone | R | m.p. | lit. m.p.[2] | % yield |
|---|---|---|---|---|
|  | H | 153-154° | 150-151°[a] | 60 |
| | Cl | 149-151° | 136-137°[b] | 63 |
| | Br | 151-152° | 145-146°[b] | 46 |
| | $OCH_3$ | 127-129° | 126-127°[c] | 38 |
| | $CH_3$ | 168-169° | 163°[d] | 58 |
| | $NO_2$ | 165-167° | 164-165°[e] | 15 |

In a large scale preparation, 2,3-diphenylindone was obtained in 53% yield and was contaminated by about 10% of 1-benzylidene-2,3-diphenylindene[3].

A similar reaction, carried out by heating one mole of 2-benzoylbenzoic acid, one mole of phenylacetic acid and two moles of $PCl_5$ at 160° for one hour, led to a mixture which was separated by fractional crystallizations from acetic acid and from benzene into two products: I (10%, colorless), $C_{22}H_{13}ClO_2$, m.p. 282-285°, $\lambda_{CO}$ 5.73 μ, and II (40%, brilliant orange-red),


PCl5
I
Cl
II
OH⁻
III
H+
IV
KMnO4
V
KMnO4 Me2CO
VI
3Steps
VII
KMnO4 OH⁻
+

$C_{22}H_{12}O_2$, m.p. 239-240°, $\lambda_{CO}$ 5.86, 6.04 $\mu$.

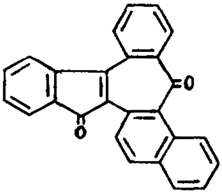
Compound I, on heating with ethanolic KOH, gave a red solution, containing the ion III; subsequent acidification afforded the spiro derivative IV, m.p. 188-190°, $\lambda_{CO}$ 5.63, 5.83 $\mu$. This product was oxidized by $KMnO_4$ to the known compound V[4].

The U.V. spectra of 2,3-diphenylindone, of II and of the ion III are almost superimposable.

Oxidation of II with $KMnO_4$ in acetone afforded the dispiro derivative VI which, by a series of known reactions[5], could be tranformed into pentaphene (VII).

The oxidation of II with $KMnO_4$ in aqueous alkaline suspension gave rather surprising results: anthraquinone and phthalic acid were obtained in almost quantitative yield. Similar types of transformations are known in the field of tropolone derivatives[6,7]. A rearrangement of an oxidation product of II, promoted by alkali, may be involved. We also observed that anthraquinone was formed in the analogous oxidation of dibenz[a,e]tropone[8], while 5-hydroxy-6-phenyldibenz[a,e]tropone[7,9] afforded anthraquinone and benzoic acid.

While analogous reactions between 2-benzoylbenzoic and 1-naphthylacetic acid or between 2-(1-naphthoyl)benzoic and phenylacetic acid failed to occur, the condensation of 2-benzoylbenzoic with 2-naphthylacetic acid yielded, as the only reaction product, a red substance, $C_{26}H_{14}O_2$, m.p. 239-241°, $\lambda_{CO}$ 5.88, 6.00 $\mu$, for which we tentatively propose the following structure:



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