

Table 1

Product No.	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	R <sub>5</sub>	R <sub>6</sub>	% yield with KOH/DMF.	Observed m.p.	Literature m.p.
IIIa	H	H	H	H	H	H	85	52°	52° <sup>8</sup>
IIIb	H	H	H	H	OCH <sub>3</sub>	H	84	78°	78° <sup>8</sup>
IIIc	OH	H	H	H	OCH <sub>3</sub>	H	84	95°	95° <sup>14</sup>
IIId	OH	H	Me	H	OCH <sub>3</sub>	H	80	99°	98° <sup>13</sup>
IIIe	OH	H	H	Me	H	H	78	99°	99° <sup>13</sup>
IIIf	OH	H	H	Me	OCH <sub>3</sub>	H	81	97°	98° <sup>13</sup>
IIIg	OH	H	H	Me	H	NO <sub>2</sub>	60	187°	187° <sup>8</sup>
IIIh	OH	H	H	Me	NO <sub>2</sub>	H	67	204°	204° <sup>8</sup>
IIIi	OH	NO <sub>2</sub>	H	Me	H	H	72	158°	158° <sup>8</sup>
IIIj	OH	NO <sub>2</sub>	H	Me	OCH <sub>3</sub>	H	65	210°	210° <sup>8</sup>
IIIk	OH	Br	H	Me	H	H	78	108°	108° <sup>13</sup>
IIIl	OH	Br	H	Me	OCH <sub>3</sub>	H	82	148°	149° <sup>13</sup>
IIIm	OH	H	H	H	H	H	80	89–90°	89–90° <sup>15</sup>

Satisfactory elemental analysis was found for all chalcones.

## A NEW ROUTE TO THE SYNTHESIS OF SOME SUBSTITUTED 3,4-BENZFLUORENES

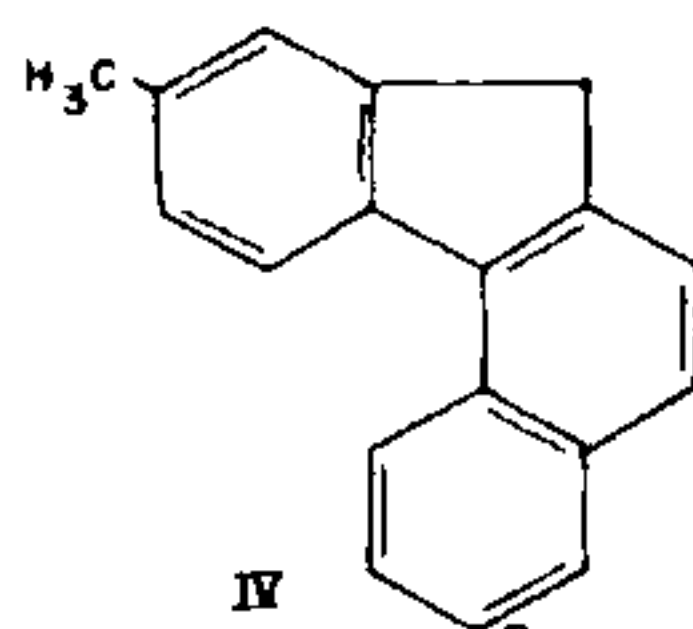
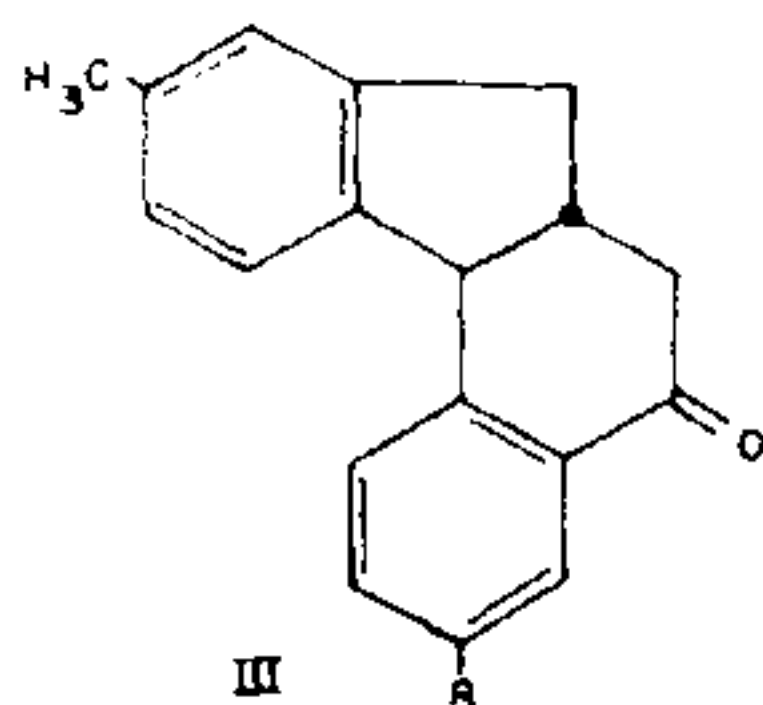
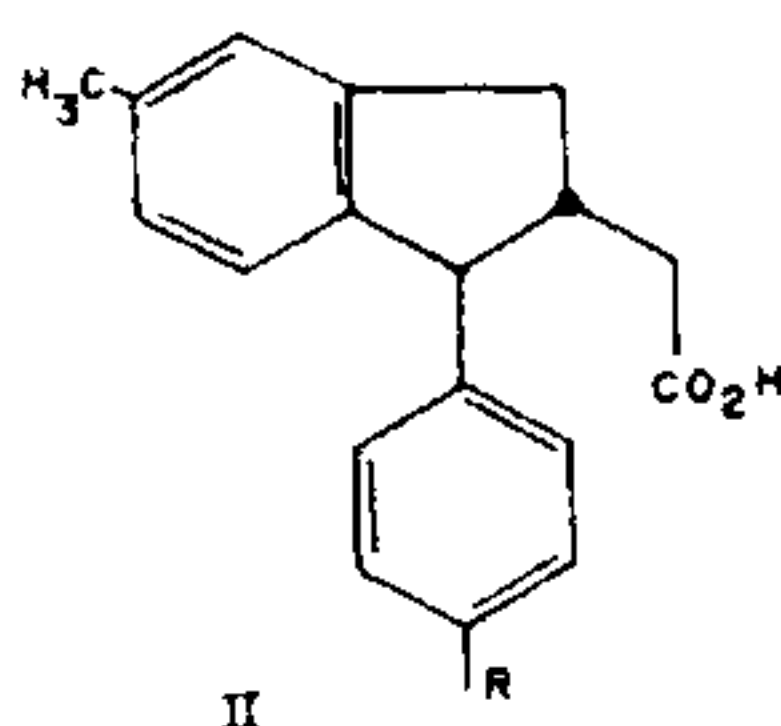
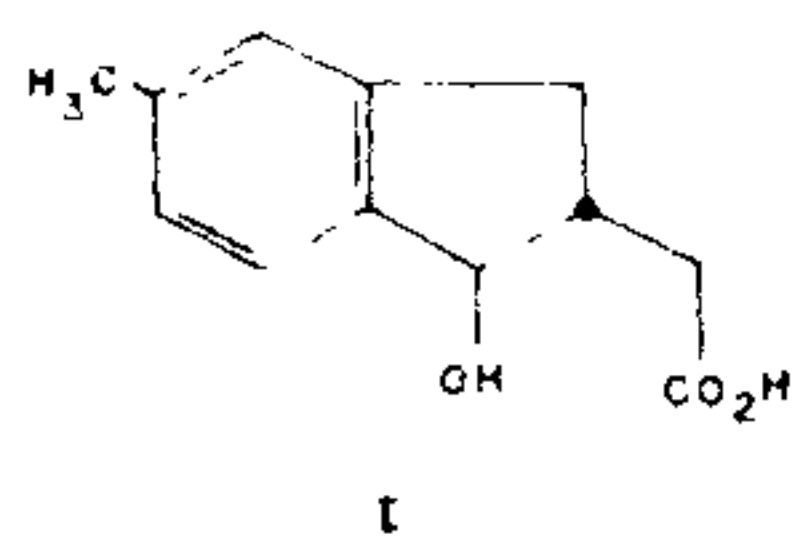
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THE AlCl<sub>3</sub>-catalyzed condensation of aromatic hydrocarbons with suitably substituted alicyclic lactones having a cyclohexane or a cyclopentane moiety, followed by cyclization, reduction and aromatization of the resulting alkylates, has a limited application in the synthesis of polycyclic compounds, due to extensive rearrangement of the resulting carbocation and polyalkylation<sup>1</sup>. In this laboratory, we have developed a method for the synthesis of some substituted 3,4-benzfluorenes by utilizing the catalyzed alkylation of aromatic hydrocarbons with a substituted indanol derivative which will generate a stable benzylic carbocation in the presence of Lewis acid and thereby promote normal alkylation.

The indanol derivative investigated by us for the alkylation study has been 5-methyl-1-hydroxy-trans-2-indanylacetic acid (I) which has been prepared from 5-methylindan-1-one-2-acetic acid, m.p. 125°, semicarbazone, m.p. 236°, methyl ester, m.p. 53°, synthesized from  $\beta$ -*p*-toluoylpropionic acid by an adaptation of the method of Roy<sup>2</sup>. Sodium borohydride reduction of the keto-acid in alkaline solution according to House *et al.*<sup>3</sup> furnished the trans-acid (I) (80%), m.p. 138°, P.M.R.:  $\delta$ , 4.21 (benzylic H, d, J = 8.8 Hz,

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trans) along with the *cis*-lactone (20%), b.p. 160°/2.5 mm., m.p. 53°.

The  $\text{AlCl}_3$ -catalyzed alkylation of benzene with the hydroxyacid (I) in a mixture of sym-TCE and nitrobenzene at low temperature furnished the normal alkylation product, 5-methyl-1-phenyl-trans-2-indanylacetic acid (II, R = H) in 65% yield, m.p. 115°, P.M.R.: dibenzyl proton at  $\delta$ , 4.2, d,  $J = 9$  Hz (trans), purified and isolated through the methyl ester, b.p. 190–195°/2 mm. Intramolecular Friedel-Crafts acylation of the acid (II, R=H), furnished the benzfluorenone derivative (III, R=H) in 66% yield, b.p. 160–165°/2 mm., which showed the characteristic trans dibenzyl-H at 4.2  $\delta$ , d, ( $J = 8.8$  Hz) and the Ar-H, peri to carbonyl group, at 7.8  $\delta$  in the PMR spectra. Reduction of the ketone by  $\text{LiAlH}_4$  followed by dehydration and dehydrogenation furnished 7-methyl-3,4-benzfluorene (IV, R=H), m.p. 70°, picrate, m.p. 136–137°<sup>4</sup>, TNB-complex, m.p. 146–147°.

The catalyzed condensation of the hydroxyacid (I) with toluene in a similar manner afforded 5-methyl-1-*p*-tolyl-trans-2-indanylacetic acid (II, R=CH<sub>3</sub>), m.p. 116°, methyl ester, m.p. 53°, in 60% yield. The structure of the acid was confirmed by an unambiguous synthesis starting from *p*-tolyl magnesium bromide and methyl 5-methyl-1-keto-2-indanylacetate followed by dehydration and catalytic hydrogenation, as well by the PMR spectra. Intramolecular Friedel-Crafts cyclization of the acid gave the benzfluorenone derivative (III, R=CH<sub>3</sub>), m.p. 99–100°, 2,4-DNP derivative, m.p. 222°, which was converted to 7,1'-dimethyl-3,4-benzfluorene (IV, R=CH<sub>3</sub>), m.p. 107°, picrate, m.p.

143°, TNB-complex, m.p. 165°. The PMR spectrum of the hydrocarbon shows two ortho coupled meso aromatic protons at  $\delta$  8.62 (d,  $J = 8.8$  Hz) and at  $\delta$  8.24 (d,  $J = 8.8$  Hz), far downfield from the rest.

The reaction is being fully investigated for the synthesis of highly substituted benzfluorenes and naphthofluorenes, some of which are of interest to us for a study of carcinogenic activity and from the standpoint of stereo-chemistry as they are likely to develop chirality due to molecular overcrowding.

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## BIOMASS ENERGETIC YIELD AND MAINTENANCE COEFFICIENTS OF *ASPERGILLUS WENTII* ON DIFFERENT CARBOHYDRATES

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ERICKSON *et al*<sup>1</sup> applied mass and energy balance regularities to aerobic microbial growth processes by using equivalents of available electrons in growth substrate, biomass and product. This approach has been used in the present investigation for evaluating the efficiency of conversion of some carbohydrates to fungal biomass using *Aspergillus wentii* Wehmer strain Pt 2804. This fungus was selected as it fulfilled most of the criteria outlined by Imrie and Righelato<sup>2</sup> for selection of suitable strains for production of fungal biomass from carbohydrates.

The fungus was cultivated in a 5-litre bioreactor containing 3.5 litre of modified Mandels and Weber's medium<sup>3</sup>. The cultivation conditions in the bioreactor runs and the determination of growth associated