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LETTERS TO THE EDITOR

To the 80th Anniversary of B.I. Ionin

Condensation of Certain Selected 1-Monoalkylisoindigo with 3,5-Di-*tert*-butyl-4-hydroxybenzyl Acetate

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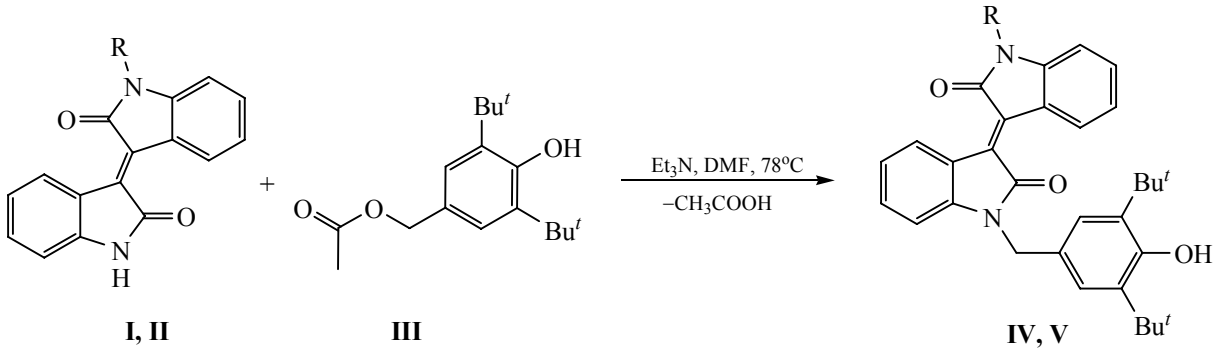
Isoindigo derivatives, along with indigo and indirubin, are representatives of indigo bisindolines; compounds of this class have been widely used in pharmaceutical chemistry and for development of functional materials. Available data indicate that many compounds containing the indoline-2-one-3-ylidene moiety possess significant antitumor activity and may be used as components of efficient anticancer drugs [1]. In this regard, special attention has been drawn to indirubin and isoindigo derivatives such as Meisoindigo and Natura that have been successfully used in leukemia treatment [2–5]. On the other hand, the presence of two lactam rings linked through the carbon–carbon double bond ensures a high electron-deficiency of isoindigo derivatives. Due to the such a structure, these molecules have been applied as electron acceptor materials in creation of organic photovoltaic devices and organic field-effect transistors [6–8].

In this work we performed condensation of monosubstituted isoindigo derivatives **I** and **II** with the hindered benzyl acetate derivative **III**. The reaction proceeded in DMF under base catalysis to form non-symmetrically substituted isoindigo derivatives **IV** and **V**. Proton substitution at the nitrogen atom was unambiguously confirmed by NMR spectroscopy. In particular, the proton signals (5.1 ppm) of the OH group not involved into the hydrogen bonding due to steric reasons appeared in ^{1}H NMR spectra of compounds **IV** and **V** instead of broad singlets of NH-

Scheme 1.



I, II **III** **IV, V**

R = CH_3 (**I, IV**), $C_{16}H_{33}$ (**II, V**).

group protons characteristic of compounds **I** and **II** (9–11 ppm). MALDI data further confirmed the composition of the obtained compounds **IV** and **V** (Scheme 1).

In summary, the proposed reaction can became a convenient approach to obtain asymmetrically substituted isoindigo derivatives with sterically hindered phenolic moiety.

1-Methyl-1'-(3,5-di-*tert*-butyl-4-hydroxybenzyl)-1*H*,1'*H*-[3,3']bis(indolinylidene-2,2'-dione) (IV). 3 Drops of Et_3N were added to a solution of 0.15 g (0.5 mmol) of 1-methylisoindigo **I** and 0.17 g (0.6 mmol) of benzyl acetate **III** in 6 mL of DMF. The reaction mixture was stirred at 78°C during 12 h and then poured into 200 mL of 10% aqueous NaCl. The vinous precipitate was filtered off, washed with hexane, and dried in air. Yield 0.23 g (85%), mp 277°C. IR spectrum (KBr), ν, cm^{-1}: 3588, 3442, 2954, 2875, 1685, 1608, 1469, 1434, 1376, 1355, 1339, 1096, 773, 742. ^{1}H NMR spectrum ($CDCl_3$), δ, ppm (*J*, Hz): 9.25 d (1H, $^3J_{HH}$ 7.8), 9.22 d (1H, $^3J_{HH}$ 8.2), 7.38 d.d (1H, $^3J_{HH}$ 7.0, $^3J_{HH}$ 7.6), 7.30 d.d (1H, $^3J_{HH}$ 7.5, $^3J_{HH}$ 8.0), 7.17 s (2H), 7.02–7.09 m (2H), 6.79–6.83 m (2H), 5.11 s (1H, OH), 4.90 s (CH_2, 2H), 3.29 s (NCH_3, 3H), 1.39 s (CH_3, 18H). Mass spectrum (MALDI), *m*/*z*: 705 [*M* + H], 727 [*M* + Na]. Found, %: C 77.43; H 6.62; N 5.31. $C_{32}H_{34}N_2O_3$. Calculated, %: C 77.70; H 6.93; N 5.66.

1-Hexadecyl-1'-(3,5-di-*tert*-butyl-4-hydroxybenzyl)-1*H*,1'*H*-[3,3']-bis(indolinylidene-2,2'-dione) (V) was obtained similarly from 0.2 g (0.4 mmol) of 1-hexadecylisoindigo **II** and 0.13 g (0.5 mmol) of benzyl acetate **III**. Yield 0.27 g (93%), mp 106°C. IR spectrum (KBr), ν, cm^{-1}: 3588, 3425, 2921, 2851, 1691, 1609, 1468, 1434, 1360, 1230, 1157, 1103, 772, 747. ^{1}H NMR spectrum ($CDCl_3$), δ, ppm (*J,* Hz): 9.25 d (1H, $^3J_{HH}$ 7.8), 9.22 d (1H, $^3J_{HH}$ 8.0), 7.38 m (1H, $^3J_{HH}$ 7.6), 7.30 d.d (1H, $^3J_{HH}$ 8.0, $^3J_{HH}$ 7.5), 7.17 s (2H), 7.08 m (1H, $^3J_{HH}$ 7.5), 7.04 m (1H, $^3J_{HH}$ 7.8, $^3J_{HH}$ 7.6), 6.82 d (1H, $^3J_{HH}$ 7.9), 6.80 d (1H, $^3J_{HH}$ 7.9), 5.14 s (1H, OH), 4.90 s (NCH_2, 2H), 3.30 s (NCH_3, 3H), 1.39 s (CH_3, 18H, *t*-Bu). Mass spectrum (MALDI), *m*/*z*: 495 [*M* + H]. Found, %: C 79.78; H 8.83; N 3.65. $C_{47}H_{64}N_2O_3$. Calculated, %: C 80.07; H 9.15; N 3.97.

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