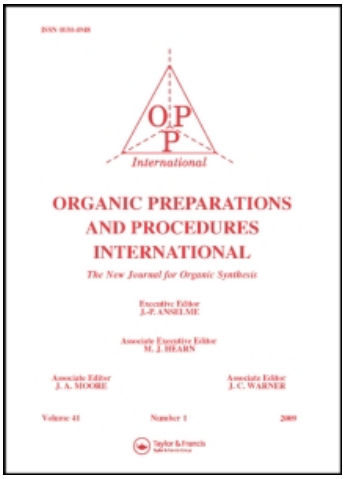

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AN EFFICIENT SYNTHESIS OF 1,3-DIMETHYL-4-(PHENYLSULFONYL)-4H-FURO[3,4-*b*]INDOLE

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5. Compound **1** was contaminated with 5% of hexamethyldisiloxane (δ 0.076) as based on integration of the ^{1}H NMR spectrum (see Table 1, entry 2). The by-product could not be removed with distillation. The by-product is chemically inert in hetero Diels-Alder reactions conducted at Ontogen Corporation.

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AN EFFICIENT SYNTHESIS OF 1,3-DIMETHYL-4-(PHENYLSULFONYL)-4*H*-FURO[3,4-*b*]INDOLE

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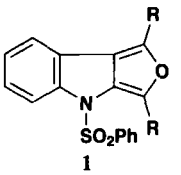
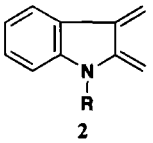
The fused heterocyclic ring system 4*H*-furo[3,4-*b*]indole (**1**) has served admirably over the past 20 years as a stable indole-2,3-quinodimethane (**2**) synthetic analogue in Diels-Alder reactions.[1,2] We have utilized this ring system in syntheses of isomeric benzocarbazoles,[1a,b,f] *bis*(benzo[*b*]carbazoles),[1c] and pyridocarbazoles including the antitumor alkaloid ellipticine (**3**).[1d,e,2h] Our synthesis of ellipticine successfully employed the 1,3-dimethyl analogue **1** (R = Me). Unfortunately, our two original methods for the syntheses of **1** (R = Me) were lengthy. We now describe a very convenient and efficient synthesis of 1,3-dimethyl-4-(phenylsulfonyl)-4*H*-furo[3,4-*b*]indole (**1**, R = Me). Our new method has the advantage over the earlier methods in that oxidation and reduction steps are avoided in the manipulation and formation of the furan ring.



1



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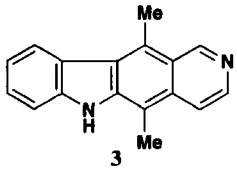
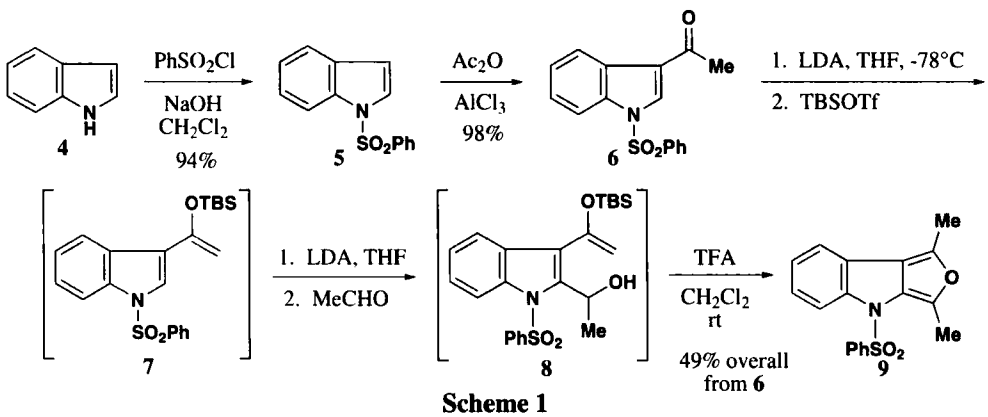


3

As we have previously described, indole (**4**) is readily converted in high yield to 3-acetyl-1-(phenylsulfonyl)indole (**6**) *via* 1-(phenylsulfonyl)indole (**5**) (Scheme 1). Treatment of **6** with lithium diisopropylamide (LDA) followed by the addition of *tert*-butyldimethylsilyl triflate (TBSOTf) gives enol ether **7**. Without isolation, **7** was further treated with LDA and then acetaldehyde to afford alcohol **8**. Exposure of **8** to trifluoroacetic acid (TFA) effects hydrolysis of the silyl enol ether and cyclodehydration to give the desired furoindole **9** in 49% yield from **6**. This synthesis of furoindole **9** represents a marked improvement of our two previous methods in terms of efficiency, reproducibility, and length.



4 5 6 7 8 9

Scheme 1

EXPERIMENTAL SECTION

Mps were determined on a Laboratory Devices Mel-Temp apparatus and are uncorrected. NMR spectra were obtained on a Varian XL-300 Fourier-transform NMR spectrometer (300 MHz). Flash chromatography was performed using flash silica gel obtained from Selecto Scientific. THF was freshly distilled from sodium/benzophenone. *tert*-Butyldimethylsilyl triflate and LDA were purchased from Acros Organics and used without further purification.

1,3-Dimethyl-4-(phenylsulfonyl)-4*H*-furo[3,4-*b*]indole (9).- To a -78° stirred solution of 3-acetyl-1-(phenylsulfonyl)indole **(6)** (3.00 g, 10.0 mmol) in dry THF (100 mL) under nitrogen was treated with a solution of LDA (2.0 M in THF/heptane, 10.0 mmol) and stirred for 15 min, after which *tert*-butyldimethylsilyl triflate (2.41 mL, 10.5 mmol) was added dropwise and the mixture was stirred at -78° for 1 h. TMEDA (1.66 mL, 11.0 mmol) and LDA (2.0 M in THF/heptane, 11.0 mmol) were added successively and, after 10 min, acetaldehyde (1.20 mL, 20.0 mmol) was added in one portion. The mixture was stirred at -78° for 1 h before it was poured into 5% HCl (100 mL). THF was removed under reduced pressure and the mixture was extracted with CH_2Cl_2 (3 x 50 mL). The combined organic extract was treated with TFA (3.0 mL, 40 mmol) for 3 h at rt. The mixture was neutralized with saturated aqueous sodium bicarbonate (100 mL) and the aqueous layer was extracted with CH_2Cl_2 (3 x 50 mL). The organic extract was dried over Na_2SO_4. Removal of solvent and crystallization of the resulting oil from MeOH (70 mL) gave a yellowish solid (1.02 g). Additional product (0.61 g) was obtained by flash chromatography of the mother liquor and drying under high vacuum to give a combined yield of 1.63 g, (49%), of **9**. Recrystallization (ether/hexanes) gave material with mp 165-167° (*lit.*[1b] mp 167-170°), whose ^1H and ^{13}C NMR spectra were identical to the literature data.[1b]

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A SIMPLE PREPARATION OF N,N-DIMETHYL-N'-ALKYL (ARYL) SULFONYLFORMAMIDINES

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The reaction of primary amines with N,N-dimethylformamide dimethyl acetal (DMF dimethyl acetal) to give trisubstituted amidines **1** is a well known transformation.[1] However, the analogous reaction with unsubstituted sulfonamides to afford N,N-dimethyl-N'-alkyl(aryl)sulfonylformamidines **1** (R= alkyl or arylsulfonyl) has been reported only for analytical purposes,[2] not as a