A SYNTHESIS OF HETEROCYCLIC RING SYSTEMS. PYRIDO[3',2':4,5]THIENO[2,3-*b*]PYRROLIZINE AND PYRIDO-[6',5':4,5][3',2':4,5]DITHIENO[2,3-*b*':2,3-*b*]DIPYRROLIZINE

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Abstract - A synthesis for two new polycyclic heterocyclic ring systems is reported. Cyclization of pyrrolidinocarboxamide derivatives of ethyl 3-(pyrrol-1-yl)thieno[2,3-*b*]pyridine-2-carboxylate **(4)** and ethyl 3,5-*di*(pyrrol-1-yl)*dithieno*[3',2'-*e*:2,3-*b*]*pyridine*-2,6-*dicarboxylate* **(11)** *afford* iminium salts that were transformed into the new heteropolycyclic compounds **(6)** and **(13)**, respectively.

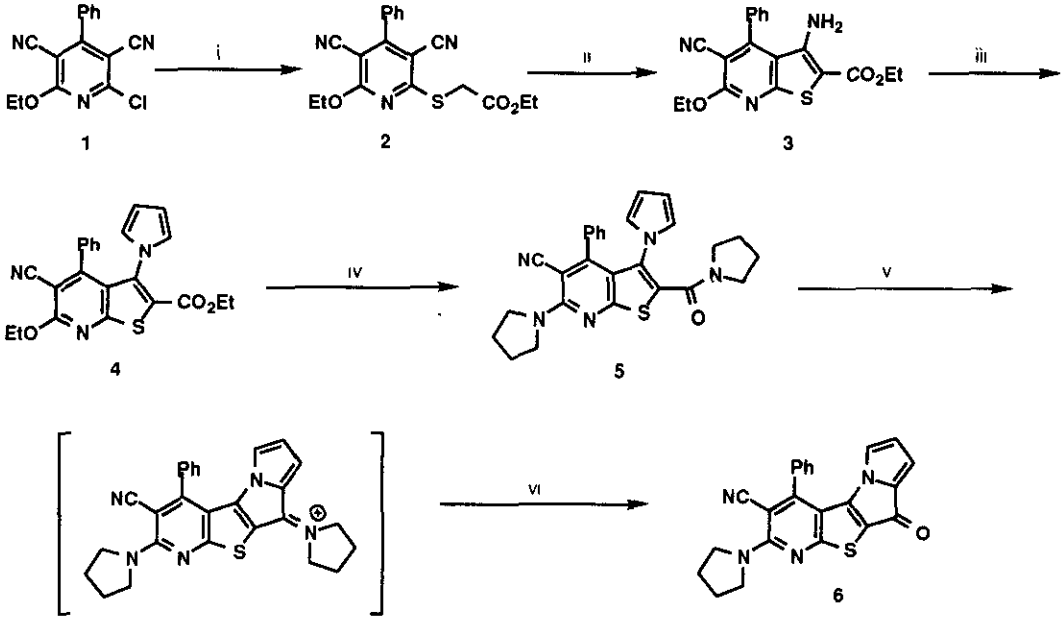
As a part of our research programme[1] aimed at the preparation of novel thiophene-fused heterocycles of therapeutical significance, we report on the synthesis of two heteropolycyclic compounds including a new ring system, namely pyrido[3',2':4,5]thieno[2,3-*b*]pyrrolizine and pyrido[6',5':4,5][3',2':4,5]dithieno[2,3-*b*':2,3-*b*]dipyrrolizine (**6** and **13**, respectively).

Recently, thiophene derivatives, which are both commercially available drugs and agents under clinical investigation, were the subject of a comprehensive review.[2] Many compounds containing the pyridothieno ring system are known to have interesting pharmacological properties. Such derivatives possess antianaphilactic,[3] antiinflammatory,[4] analgesic,[5] antipyretic,[6] hypocholesterolemic,[7] antibacterial[8] or antiallergic[9] activity. In adition, some of them have good vasodilating and hypotensive properties,[10] *inhibit platelet agregation*[11] *or possess potential* antineoplastic activity.[12] On the other hand, a number of heterocyclic compounds containing the pyrrolo moitey reportedly exhibit major pharmacological activity especially as antitumour[13] and anxiolytic and antipsychotic[14] agents. All these properties aroused our interest in synthesing new heterocyclic compounds including both pyridothieno and pyrrolo moieties. With suitable substituents, these structures allow different derivatives related to compounds of biological and pharmacological interest to be obtained.

The synthesis of the title compound **(6)** was accomplished by starting from 2-chloro-3,5-dicyano-6-ethoxy-4-phenylpyridine **(1)**[15] and using the procedure summarized in the Scheme 1. The thiophene ring was added on the pyridine ring by condensing **1** with ethyl 2-mercaptoacetate in

the presence of an equimolecular amount of potassium carbonate in refluxing ethanol to give the 2-ethoxycarbonylmethylthiopyridine-3-carbonitrile **(2)**, which, on refluxing with ethanol in the presence of excess anhydrous potassium carbonate, underwent Thorpe-Ziegler cyclization to yield ethyl 3-aminothieno[2,3-*b*]pyridine-2-carboxylate **(3)**. This amine **(3)** was also obtained directly from **1** and ethyl 2-mercaptoacetate using excess of potassium carbonate.

Scheme 1

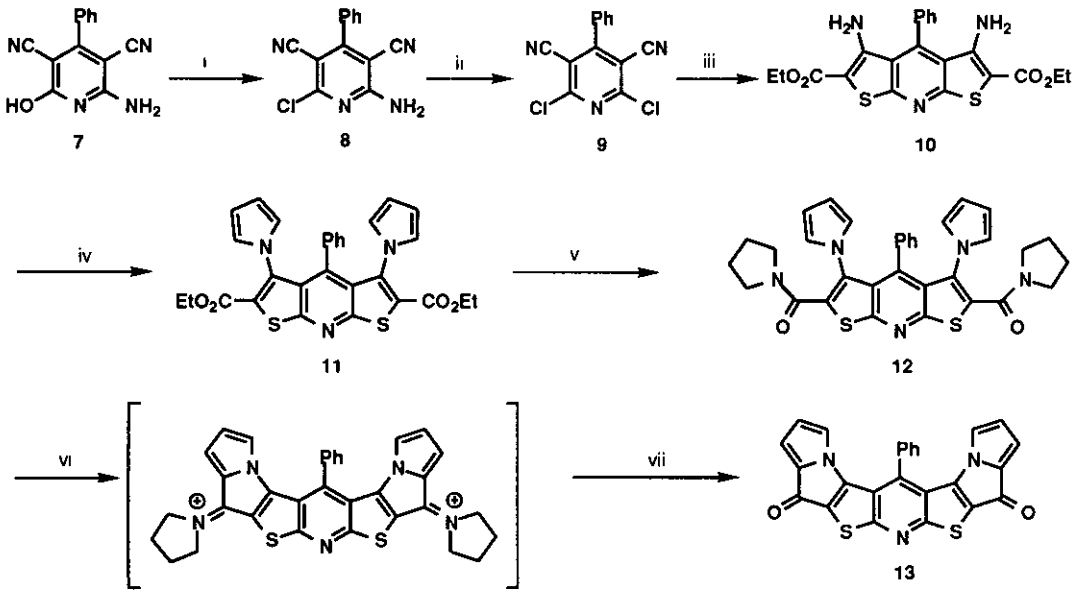


Reagents: i: $HSCH_2CO_2Et$, K_2CO_3,EtOH, reflux, 30 min. ii. K_2CO_3, EtOH, reflux, 1 h. iii: DMTHF, AcOH, reflux, 30 min. iv: Pyrrolidine, reflux, 24 h. v: $POCl_3$, CH_2Cl_2, reflux, 3.5 h. vi: KOH

Reaction of ethyl 3-aminothieno[2,3-*b*]pyridine-2-carboxylate **(3)** with 2,5-dimethoxytetrahydrofuran in acetic acid according to the Clauson-Kaas method[16] gave ethyl 3-(pyrrol-1-yl)thieno[2,3-*b*]pyridine-2-carboxylate **(4)**, which, on prolonged refluxing in pyrrolidine,[17] afforded the *N*-pyrrolidinoamide **(5)**. A concomitant displacement of the ethoxy substituent by the pyrrolidine moiety in the resulting product **(5)** was also observed. Bischler-Napieralski cyclization of this compound in boiling phosphorus oxychloride yielded an iminium salt that was hydrolyzed to the expected tetracyclic ketone **(6)** by the action of aqueous sodium hydroxide according to the Rault procedure.[18] The starting material for the synthesis of the desired heteropolycyclic compound pyrido[6',5':4,5][3',2':4,5]dithieno[2,3-*b*':2,3-*b*]dipyrrolizine **(13)** was 2,6-dichloro-3,5-dicyano-4-phenylpyridine **(9)** which was synthesized as shows in Scheme 2.

The readily available 2-amino-3,5-dicyano-5-hydroxy-4-phenylpyridine **(7)**[15] was transformed into the corresponding chloroderivative **(8)** by using phosphoryl chloride. Treatment of **8** with isoamyl

Scheme 2



Reagents: i: PCl_5, $POCl_3$, reflux, 24 h. ii $CuCl_2$, *t*-Amyl Nitrite, CH_3CN, r.t , 12 h. iii: $HSCH_2CO_2Et$, K_2CO_3, EtOH, reflux, 48 h. iv: DMTHF, AcOH, reflux, 3 h. v: Pyrrolidine, reflux, 1.5 h. vi: $POCl_3$, reflux, 36 h. vii: KOH.

nitrite and copper(II) chloride in acetonitrile at 65°C yielded the desired 2,6-dichloro derivative **(9)**. Reaction of this compound with ethyl 2-mercaptoacetate and subsequent base-promoted intramolecular ring formation afforded the *ortho*-aminothienopyridinecarboxylate **(10)** in 81% yield. Condensation of this compound with 2,5-dimethoxytetrahydrofuran in acetic acid under reflux, gave ethyl 3,5-di(pyrrol-1-yl)dithieno[3',2'-*e*:2,3-*b*]pyridine **(11)** as the main compound. After removal of acetic acid, treatment of **11** with pyrrolidine gave the amide **(12)**. Cyclization with phosphoryl chloride and subsequent hydrolysis of the intermediate iminium salt with aqueous sodium hydroxide afforded the desired polycyclic derivative **(13)**. The reactions involved and results obtained are shown in Scheme 2.

The presence of the pyrrolizidine moiety makes pyridothienopyrrolizine derivatives **(6** and **13)** interesting as potential antitumour agents. In fact, several natural substances belonging to the pyrrolizine class[19,20] and other related heteropolycyclic compounds of pharmaceutical interest are antineoplastic agents that may be selective for hypoxic cells in solid tumours.[21]

EXPERIMENTAL SECTION

All reagents used were commercial grade chemicals from freshly opened containers. Melting points were determined on a Buchi 510 apparatus and are reported uncorrected. Ir spectra were recorded on potassium bromide disks on a Perkin-Elmer 383 spectrophotometer. ^1H and ^{13}C nmr spectra were obtained on a Bruker AC200F instrument at room temperature. Mass spectra were

obtained at 70 eV by using a VG4 spectrometer. The silica gel 60 $HF_{254+366}$ used for analytical thin layer chromatography and the silica gel 60 (230-400 mesh) employed for medium-pressure chromatography (mplc) were purchased from Merck. Microanalyses for C, H, and N were performed by the Elemental Analyses General Service of the University of La Coruña.

6-Ethoxy-2-ethoxycarbonylmethylthio-4-phenylpyridine-3,5-dicarbonitrile (2)

A solution of 2-chloro-6-ethoxy-4-phenylpyridine-3,5-dicarbonitrile (**1**, 1.20 g, 4.23 mmol), ethyl 2-mercaptoacetate (0.55 ml, 5.07 mmol) and Na_2CO_3 in ethanol (40 ml) was refluxed for 10 min. After cooling, the solid was filtered off and recrystallized from ethanol/acetone to yield **2** (0 91 g, 70%); mp 132-134 °C. ^{1}H Nmr ($CDCl_3$) δ: 1.28 (t, 3H, J = 7.1 Hz, CH_3); 1.47 (t, 3H, J = 7.1 Hz, CH_3); 3.99 (s, 2H, SCH_2); 4.26 (q, 2H, J = 7.1 Hz, OCH_2); 4.56 (q, 2H, J = 7.1 Hz, OCH_2); 7.50-7.58 (m, 5H, C_6H_5). ^{13}C Nmr ($CDCl_3$) δ: 14.0 (CH_3); 14.2 (CH_3); 32 9 (SCH_2); 62.1 (OCH_2); 65.0 (OCH_2); 92 6, 99.6 (C-3, C-5); 113.3 (CN); 113.8 (CN); 128.4, 129.0, 131.1, 132.3 (C_6H_5); 159.4 (C-2); 164.3; 166.8, 167 8 . Ir (KBr): 2220 (CN); 1750 (CO), 1550; 1340. Ms (DEI, 70eV) m/z (%): 367 (M^+, 32); 338 (30); *320 (15); 294 (18); 266 (100); 165 (43). Anal Calcd for* $C_{19}H_{17}N_3O_3S$· C, 62.11; H, 4.66, N, 11.43. Found: C, 62.23; H, 4.54; N, 11.50

Ethyl 3-amino-5-cyano-6-ethoxy-4-phenylthieno[2,3-*b*]pyridine-2-carboxylate (3)

A solution of **2** (0.40 g, 1.1 mmol) and K_2CO_3 (0.18 g, 1 3 mmol) in ethanol (10 ml) was refuxed for 1 h The solid was filtered off and recrystallized from ethanol/acetone to yield **3** (0.36, 90%), mp 244-246°C. ^{1}HNmr ($CDCl_3$) δ: 1.36 (t, 3H, J = 7.1 Hz, CH_3); 1.50 (t, 3H, J = 7.1 Hz, CH_3); 4.30 (q, 2H, J = 7.1 Hz, OCH_2); 4.61 (q, 2H, J = 7 1 Hz, OCH_2); 5.50 (br s, 2H, exchangeable with D_2O, NH_2); 7.42-7 64 (m, 5H, C_6H_5) ^{13}C Nmr ($CDCl_3$) δ: 14 2 (CH_3); 14.4 (CH_3), 60.5 (OCH_2); 64 2 (OCH_2); 95.3 (C-5); 114.2 (CN); 116.9 (C-3a), 128.2, 129.4, 130.5, 133.1 (C_6H_5); 147.5 (C-3), 153.6 (C-7a), 162.8, 163.6, 165.1 (C-4, C-6, CO). Ir (KBr): 3380 (NH); 3500 (NH); 2220 (CN); 1660 (CO); 1600; 1550; 1340. Ms (DEI, 70eV) m/z (%). 367 (M^+, 65); 339 (17); 320 (15), 292 (100); 264 (29); 236 (12) Anal. Calcd for $C_{19}H_{17}N_3O_3S$: C, 62.11; H, 4.66; N, 11.43 Found: C, 62 29, H, 4.45, N, 11.40

Ethyl 5-cyano-6-ethoxy-4-phenyl-3-(pyrrol-1-yl)thieno[2,3-*b*]pyridine-2-carboxylate (4)

A solution of **3** (1.02 g, 2.72 mmol) and 2,5-dimethoxytetrahydrofuran (0.53 ml, 4.08 mmol) in acetic acid (11 ml) was refluxed for 30 *min. After cooling, the solid was filtered off and recrystallized from ethanol* to yield **4** (0.90 g, 78%), mp 168-170°C ^{1}H Nmr ($CDCl_3$) δ: 1.18 (t, 3H, J = 7.1 Hz, CH_3); 1.51 (t, 3H, J = 7 0 Hz, CH_3); 4.49 (q, 2H, J = 7.1 Hz, OCH_2); 4.64 (q, 2H, J = 7.0 Hz, OCH_2); 5.78 (t, 2H, J = 2.1 Hz, Hpyrrol); 6.22 (t, 2H, J = 2.2 Hz, Hpyrrol); 7.01-7 30 (m, 5H, C_6H_5). ^{13}C Nmr ($CDCl_3$) δ: 13.9 (CH_3), 14.3 (CH_3); 61.9 (OCH_2); 64.5 (OCH_2); 97.7 (C-5); 109.1 (CH); 114.2 (CN); 121.6 (C-3a), 122 0 (NCH), 125.4 (C-2); 127.2, 128 1, 129.0, 132.1 (C_6H_5), 136.8 (C-3); 155.2 (C-7a); 160.3, 161.4, 162.5 (CO, C-4, C-6) Ir (KBr). 2220 (CN), 1700 (CO), 1550; 1480, 1340. Ms (DEI, 70 eV) m/z (%): 417 (M^+, 100); 344 (38); 317 (59); 316 (67); 286 (42); 272 (13). Anal. Calcd for $C_{23}H_{19}N_3O_3S$: C, 66.17; H, 4 59; N,10 07 Found: C, 66.32; H, 4.42; N,10.15.

4-Phenyl-2-(pyrrolidine-1-carbonyl)-6-(pyrrolidin-1-yl)-3-(pyrrol-1-yl)thieno[2,3-*b*]pyridine-5-carbonitrile (5)

A solution of **4** (1 02 g, 2.44 mmol) in pyrrolidine (8.5 ml) was refluxed for 24 h The solvent was removed under reduced pressure and purified by mplc using CH_2Cl_2/EtOH (99·1) as eluent to yield **5** (1 01 g, 89%), mp 237-239°C. ^{1}H Nmr ($CDCl_3$) δ: 1.52-1.77 (m, 4H, $CH_2.C\underline{H}_2.C\underline{H}_2.CH_2$); 1.98-2.04 (m, 4H, $CH_2.C\underline{H}_2.C\underline{H}_2.CH_2$); 2.65 (t, 2H, J = 6.5 Hz, N-CH_2); 3.41 (t, 2H, J = 7.0 Hz, N-CH_2); 3.81-3.88 (m, 4H, N-CH_2), 5 69 (t, 2H, J = 2.1 Hz, Hpyrrol); 6.20 (t, 2H, J = 2.0 Hz, Hpyrrol), 7.02-7.25 (m, 5H, C_6H_5) ^{13}C Nmr ($CDCl_3$) δ: 24.0 (CH_2); 25.5 (CH_2); 25.6 (CH_2); 45.8 (CH_2); 47.3 (CH_2); 49.9 (CH_2); 91.4 (C-5), 109.2 (CH); 116.2 (CN); 117.7, 125.4, 129.2 (C-2, C-3, C-3a);

121.0 (NCH); 127.9, 128.9, 133.6 (C_6H_5); 153.9 (C-6); 155.6 (C-7a); 161.1, 163.2 (CO, C-4) Ir (KBr): 2220 (CN); 1630 (CO); 1550; 1480; 1430. Ms (DEI, 70 eV) m/z (%): 467 (M^+, 38); 398 (62); 369 (44), 341 (26). Anal. Calcd for $C_{27}H_{25}N_5OS$: C, 69.35; H, 5.39; N, 14.98. Found: C, 69.50; H, 5 51; N, 15.14.

3-Cyano-9-oxo-4-phenyl-2-(pyrrolidin-1-yl)pyrido[3',2':4,5]thieno[2,3-*b*]pyrrolizine (6)

A solution of **5** (0 32 g, 0.68 mmol), $POCl_3$ (2 ml, 7.8 mmol) in CH_2Cl_2 (5 ml) was refluxed for 3 5 h The reaction mixture was allowed to stand overnight at room temperature. The mixture was cooled, following the addition of CH_2Cl_2 (10 ml) and then poured into 50 ml of 25% aqueous KOH. The mixture was extracted twice with 30 ml portions of CH_2Cl_2 and the organic layer was washed with water and 10% HCl, then was dried over anhydrous sodium sulfate. The solvent was removed under reduced pressure and putified by mplc using CH_2Cl_2 as eluent to yield **6** (0.21 g, 83%), mp >300°C. ^{1}H Nmr($CDCl_3$) δ: 2.04 (m, 4H, Hpyrrolidine); 3.89 (m, 4H, Hpyrrolidine); 4.06 (d, 1H, J = 2.8 Hz, H-8); 5.63 (dd, 1H, J = 3.7, J = 2.8 Hz, H-7); 6.52 (dd, 1H, J = 3.7, J = 0.9 Hz, H-6); 7.41-7.64 (m, 5H, C_6H_5). ^{13}C Nmr (*$CDCl_3$*) δ: *25.6 (CH_2); 50.0 (CH_2); 92.1 (C-3); 111.3 (CN); 113.0 (CH); 115.7(CH), 117.0; 118.8; 123.3 (CH); 128* 2, 130.0, 130.5, 134.5 (C_6H_5); 136.0; 146 1; 153.0 (C-10a); 154.5 (C-2); 170.2, 175.2 (CO, C-4) Ir (KBr): 2220 (CN), 1670 (CO); 1550; 1440. Ms (DEI, 70 eV) m/z (%): 396 (M^+, 100); 395 (47); 368 (25); 341 (12). Anal. Calcd for $C_{23}H_{16}N_4OS$: C, 69.68; H, 4.07; N, 14.13. Found: C, 69.58; H, 3.91; N, 13.98.

2-Amino-6-chloro-4-phenylpiridine-3,5-dicarbonitrile (8)

A solution of **7** (1.0 g, 1 29 mmol), PCl_5 (0.27 g, 1.29 mmol) in $POCl_3$ (20 ml) was refluxed for 24 h. The solvent was removed under reduced pressure following the addition of ice (200 g). The solid was filtered off and purified by mplc using CH_2Cl_2 as eluent to yield **8** (0.3 g, 33%), mp 194-196°C. ^{1}H Nmr ($CDCl_3$) δ: 7.56 (s, 5H, C_6H_5); 8.35 (br s, 2H, NH_2) ppm. ^{13}C NMR ($CDCl_3$) δ. 89.7 (C-CN); 114.4 (CN); 115.0 (CN); 128.4, 128.8, 130.7, 133.6 (C_6H_5); 155.3 (C-6); 160.3; 160.5 Ir (KBr)· 3400 (NH); 3200 (NH); 2220 (CN); 1650. Ms (DEI, 70 eV) m/z (%): 254 (M^+, 100); 219 (40); 192 (11); 165 (59). Anal. Calcd for $C_{13}H_7N_4Cl$: C, 61.31, H, 2 77; N, 21.99. Found: C, 61.20; H, 2.96; N, 22.11.

2,6-Dichloro-4-phenylpiridine-3,5-dicarbonitrile (9)

To a rapidly stirred mixture of anhydrous copper(II) chloride (0 19 g, 1.41 mmol), *i*-amyl nitrite (0.21 g, 1 79 mmol) in anhydrous acetonitrile (20 ml) **8** (0.3 g, 1.18 mmol) was added. The reaction was heated at 65°C for 5 h. After the mixture was cooled, the reaction solution was poured into 30 ml of 20% aqueous hydrochloric acid. The solid was filtered off and putified by MPLC using CH_2Cl_2 as eluent to yield **9** (0 2 g, 63%), mp 204-206°C. ^{1}H Nmr ($CDCl_3$) δ: 7.54-7 68 (m, 5H,C_6H_5). ^{13}C Nmr ($CDCl_3$) δ: 110 0 (C-3); 112.4 (CN); 128.5, 129.5, 131.1, 132.2 (C_6H_5); 156 0 (C-2); 161.1 (C-4). Ir (KBr) : 2220 (CN), 1530; 1350; 1100 Ms (DEI, 70 eV) m/z (%): 273 (M^+, 100); 238 (30); 237 (90); 211 (10); 202 (52). Anal. Calcd for $C_{13}H_5N_3Cl_2$: C, 56.94; H, 1 84, N, 15.33 Found. C, 57.13, H, 1 70, N, 15.45.

Ethyl 3,5-diamino-4-phenyldithieno[3',2'-*e*:2,3-*b*]pyridine-2,6-dicarboxylate (10)

A solution of **9** (4.0 g, 14.6 mmol), ethyl-2-mercaptoacetate (3 15 ml, 32.1 mmol) and Na_2CO_3 (3 g, 29.2 mmol) in ethanol/THF (2·1, 150 ml) was refluxed for 48 h. After cooling, the solid was filtered off and recrystallized from ethanol/ CH_2Cl_2 to yield **10** (5.2 g, 81%); mp >300°C.^{1}H Nmr ($CDCl_3$) δ: 1.3$ (t, 6H, J = 7.2 Hz, $2CH_3$); 4.31 (q, 4H, J = 7.2 Hz, $2OCH_2$); 5.42 (br s, 4H, $2NH_2$); 7 54-7.68 (m, 5H, C_6H_5). ^{13}C Nmr ($CDCl_3$) δ: 14.4 (CH_3); 60 5 (OCH_2); 96.2 (C-2), 119.6 (C-3a); 128.4, 129.6, 130.5, 133.0 (C_6H_5); 143 0, 148.1 (C-3, C-

7a); 162 1, 165.5 (C-4, CO). Ir (KBr): 3495 (NH), 3400 (NH); 1680 (CO); 1600; 1530; 1350. Ms (DEI, 70 eV) m/z (%): 441 (M^+, 100); 413 (13); 395 (14); 394 (46), 366 (12), 294 (11) Anal. Calcd for $C_{21}H_{19}N_3O_4S_2$: C, 57 11; H, 4 33; N, 9.52. Found: C, 57.02; H, 4.19; N, 9.41.

Ethyl 3,5-di(pyrrol-1-yl)-4-phenyldithieno[3',2'-*e*:2,3-*b*]pyridine-2,6-dicarboxylate (11)

A solution of **10** (0.2 g, 0.45 mmol) and 2,5-dimethoxytetrahydrofuran (0.17 ml, 1.36 mmol) in acetic acid (30 ml) was refluxed for 3 h. After cooling, the solid was filtered off and recrystallized from ethanol/CH_2Cl_2 to yield **11** (0.24 g, 98%), mp 276-277°C. ^{1}H Nmr ($CDCl_3$) δ: 1.17 (t, 6H, J = 7.2 Hz, $2CH_3$); 4.19 (q, 4H, J = 7.2 Hz, $2OCH_2$); 5.74 (t, 4H, J = 2.0 Hz, 4Hpyrrol); 6.13 (t, 4H, J = 2.1 Hz, 4Hpyrrol); 6.69-6.94 (m, 5H, C_6H_5). ^{13}C Nmr ($CDCl_3$) δ: 13.8 (CH_3); 62 0 (OCH_2); 109.0 (CH); 122.3 (NCH), 125.5 (C-2); 127 1, 127.2, 129 3, 130 1 (C_6H_5), 137.0 (C-3), 146.7 (C-7a); 159.8 (CO); 160.6 (C-4). Ir (KBr): 1730 (CO). Ms (DEI, 70 eV) m/z (%): 541 (M^+, 98); 422 (10); 397 (20); 393 (17); 224 (13). Anal. Calcd for $C_{29}H_{23}N_3O_4S_2$: C, 64 31 ; H, 4.28; N, 7.76. Found. C, 64.19; H, 4.35; N, 7.67.

4-Phenyl-2,6-di(pyrrolidine-1-carbonyl)-3,5-di(pyrrol-1-yl)dithieno[3',2'-*e*:2,3-*b*]pyridine (12)

A solution of **11** (0.12 g, 0.22 mmol) in pyrrolidine (6 ml) was refluxed for 1 5 h After cooling, the solid was filtered off and recrystallized from ethanol/CH_2Cl_2 to yield **12** (0.13 g, 95%), mp >300°C. ^{1}H Nmr ($CDCl_3$) δ: 1.54-1.74 (m, 8H, $2CH_2$-CH_2); 2.82 (t, 4H, J = 6.5 Hz, N-CH_2), 3.40 (t, 4H, J = 6.9 Hz, N-CH_2), 5 66 (t, 4H, J = 2 1 Hz, 4Hpyrrol), 6.16 (t, 4H, J = 2 1 Hz, 4Hpyrrol); 6.63-6.97 (m, 5H, C_6H_5). ^{13}C Nmr ($CDCl_3$) δ. 24.0 (CH_2); 25.3 (CH_2); 45.7 (CH_2); 47.6 (CH_2); 109.0 (CH); 121.2 (NCH); 122.8, 129.2, 132.2 (C-2, C-3, C-3a); 126.9, 127 1, 127 3, 131.3 (C_6H_5); 142.9 (C-7a); 158.2 (CO); 160 8 (C-4). Ir (KBr) 1620 (CO); 1555; 1525; 1480; 1440. Ms (DEI, 70 eV) m/z (%): 591 (M^+, 13); 522 (8); 453 (15); 396 (10). Anal. Calcd for $C_{33}H_{29}N_5O_2S_2$: C, 66.98; H, 4.94; N, 11.83. Found: C, 67.05; H, 4 74; N, 11 72.

10,13-Dioxo-5-phenylpyrido[6',5':4,5][3',2':4,5]dithieno[2,3-*b*':2,3-*b*]dipyrrolizine (13)

A solution of **12** (0 1 g, 0 16 mmol) in $POCl_3$ (5 ml) was refluxed for 36 h The solvent was removed under reduced pressure following the addition of CH_2Cl_2 (10 ml) and ice (100 g), then poured into 25 ml of 25% aqueous KOH. The mixture was extracted twice with 30 ml portions of CH_2Cl_2 and the organic layer was washed with water and 10% HCl, then was dried over anhydrous sodium sulfate The solvent was removed under reduced pressure and purified by MPLC using CH_2Cl_2 as eluent to yield **13** (0.03 g, 42%) mp >300°C Ir (KBr): 1700 (CO); 1550, 1450. Ms (DEI, 70 eV) m/z (%) 449 (M^+, 100), 419 (7) Anal Calcd for $C_{25}H_{11}N_3O_2S_2$ C, 66.80, H, 2 47, N, 9.35. Found: C, 66.92; H, 2.59; N, 9.55.

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