

(五) *N*-Substituted benzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]-quinolin-3,4-dione (68-82) 之合成

N-Benzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (68) 之合成

取化合物 **29** (2.29g , 0.01mole) 懸著於 DMF 30 ml 中 , 加入無水 K_2CO_3 (1.38 g , 0.01 mole) 加熱(約 70-80) 使之溶解 , 加入 benzyl chloride (11.3g , 0.1mole) , 反應 1 小時後加冰水 , 以 $CHCl_3$ 萃取 , 取 $CHCl_3$ 層 , 以無水 $MgSO_4$ 乾燥 , 減壓濃縮後 , 收集沉澱物以短程矽膠管柱層析 ($CHCl_3/EtOH$) 沖提 , 再以 MeOH 及 $CHCl_3$ 做再結晶 , 得白色棉絮狀結晶 , 為化合物 **68** (2.23g , 70.0 %) , mp : 260-261 。 光譜數據如下 : MS m/z : 319; IR (KBr) cm^{-1} : 1705.6 ($C_3=O$) , 1613.0 ($C_4=O$) ; UV λ_{max} nm (MeOH) (log ϵ): 247 (4.87) ; 1H -NMR (DMSO- d_6) δ : 1.10 (3H, t, $J=7.5$ Hz, $C_7-CH_2CH_3$) , 2.64 (2H, q, $J=7.5$ Hz, $C_7-CH_2CH_3$) , 4.92 (2H, s, H-2) , 5.57 (2H, s, H-10) , 7.25-7.37 (6H, m, H-6, Ar-H) , 7.48 (1H, s, H-8) , 8.09 (1H, d, $J=8.0$ Hz, H-5) ; ^{13}C -NMR (DMSO- d_6) δ : 15.15 ($C_7-CH_2CH_3$) , 28.55 ($C_7-CH_2CH_3$) , 46.33 (C-10) , 76.13 (C-2) , 100.24 (C-3a) , 116.10 (C-8) , 124.76 (C-4a) , 124.95 (C-6) , 127.01 (C-5, C-13, C-15) , 128.01 (C-14) , 129.07 (C-12, C-16) , 135.25 (C-11) , 138.45 (C-8a) , 150.01 (C-7) , 171.44 (C-9a) , 174.82 (C-4) , 191.17 (C-3) .

N-*o*-Methylbenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (69) 之合成

取化合物 **29** (2.29g , 0.01mole) 和 *o*-methylbenzyl chloride (12.7g , 0.1mole) 為原料 , 比照化合物 **68** 的合成法及處理步驟 , 得化合物 **69** (1.95g , 58.6 %) , mp: 248-250 。 光譜數據如下 : MS m/z : 333; IR (KBr) cm^{-1} : 1728.8 ($C_3=O$) , 1628.4 ($C_4=O$) ; UV λ_{max} nm (MeOH) (log ϵ): 249 (4.64) ; 1H -NMR (DMSO- d_6) δ : 1.08 (3H, t, $J=7.6$ Hz, $C_7-CH_2CH_3$) , 2.46 (3H, s, $C_{12}-CH_3$) , 2.62 (2H, q, $J=7.6$ Hz, $C_7-CH_2CH_3$) , 4.86 (2H, s, H-2) , 5.51 (2H, s, H-10) , 6.68 (1H, d, $J=8.0$ Hz, H-6) , 7.04-7.32 (5H, m, Ar-H, H-8) , 8.13 (1H, d, $J=8.0$ Hz, H-5) ; ^{13}C -NMR (DMSO- d_6) δ : 15.21 ($C_7-CH_2CH_3$) , 18.93 ($C_{12}-CH_3$) , 28.52 ($C_7-CH_2CH_3$) , 44.83 (C-10) , 76.13 (C-2) , 100.13 (C-3a) , 115.95 (C-8) , 124.39 (C-15) , 124.74 (C-4a) , 125.01 (C-6) , 126.55 (C-14) , 126.98 (C-13) , 127.58 (C-5) , 130.67 (C-16) , 132.95 (C-11) , 135.26 (C-8a) , 138.69 (C-12) , 150.13 (C-7) , 171.47 (C-9a) , 175.02 (C-4) , 191.08 (C-3) .

N-*m*-Methylbenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (70) 之合成

取化合物 **29** (2.29g , 0.01mole) 和 *m*-methylbenzyl chloride (12.7g , 0.1mole) 為原料 , 比照化合物 **68** 的合成法及處理步驟 , 得化合物 **70** (2.16g , 64.86 %) , mp: 252~254 。 光譜數據如下 : MS m/z : 333; IR (KBr) cm^{-1} : 1705.6 ($C_3=O$) , 1613.0 ($C_4=O$) ; UV λ_{max} nm (MeOH) (log ϵ): 249 (4.39) ; 1H -NMR (DMSO- d_6) δ : 1.14 (3H, t, $J=7.6$ Hz, $C_7-CH_2CH_3$) , 2.25 (3H, s, $C_{13}-CH_3$) , 2.66 (2H, q, $J=7.6$ Hz,

C₇-CH₂CH₃), 4.92(2H, s, H-2), 5.52(2H, s, H-10), 7.07-7.29 (5H, m, Ar-H, H-6), 7.48 (1H, s, H-8), 8.09 (1H, d, J=8.1 Hz, H-5); ¹³C-NMR (DMSO-*d*₆) δ: 15.10 (C₇-CH₂CH₃), 21.14 (C₁₃-CH₃), 28.54 (C₇-CH₂CH₃), 46.34 (C-10), 76.13 (C-2), 100.26 (C-3a), 116.11 (C-8), 124.11 (C-4a), 124.75 (C-6), 124.95 (C-16), 126.90 (C-5), 127.54 (C-14), 128.70 (C-15), 128.97 (C-12), 135.18 (C-11), 138.38 (C-13), 138.49 (C-8a), 149.96 (C-7), 171.46 (C-9a), 174.79 (C-4), 191.24 (C-3).

***N-p*-Methylbenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (71) 之合成**

取化合物 **29** (2.29g , 0.01mole) 和 *p*-methylbenzyl chloride (12.7g , 0.1mole) 為原料，比照化合物 **68** 的合成法及處理步驟，得化合物 **71** (2.45g , 73.57 %)，mp : 182-184 。光譜數據如下：MS *m/z*: 333.2; IR (KBr) cm⁻¹: 1705.6 (C₃=O)，1613.0 (C₄=O)；UV λ_{max} nm (MeOH) (log ε): 249 (4.58)；¹H-NMR (DMSO-*d*₆) δ: 1.12 (3H, t, J=7.6 Hz, C₇-CH₂CH₃), 2.24 (3H, s, C₁₄-CH₃), 2.65 (2H, q, J=7.6 Hz, C₇-CH₂CH₃), 4.92 (2H, s, H-2), 5.53 (2H, s, H-10), 7.14 (2H, d, J=8.0 Hz, H-13, H-15), 7.23-7.29 (3H, m, H-6, H-12, H-16), 7.49 (1H, s, H-8), 8.09 (1H, d, J=8.1 Hz, H-5)；¹³C-NMR (DMSO-*d*₆) δ: 15.18(C₇-CH₂CH₃), 20.86 (C₁₄-CH₃), 28.60(C₇-CH₂CH₃), 46.16(C-10), 76.16(C-2), 100.26(C-3a), 116.15(C-8), 124.79(C-4a), 124.95 (C-6), 126.94(C-5), 127.01(C-13, C-15), 129.64(C-12, C-16), 132.23(C-11), 137.35 (C-14), 138.47 (C-8a), 150.00 (C-7), 171.46 (C-9a), 174.78 (C-4), 191.22 (C-3).

***N-m*-Methoxybenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione(72) 之合成**

取化合物 **29**(2.29g , 0.01mole)和 *m*-methoxybenzyl chloride(14.3g , 0.1mole) 為原料，比照化合物 **68** 的合成法及處理步驟，得化合物 **72** (2.16g , 61.89 %)，mp:252-254 。光譜數據如下：MS *m/z*: 349; IR (KBr) cm⁻¹: 1713.3(C₃=O), 1613.0 (C₄=O)；UV λ_{max} nm (MeOH) (log ε): 248 (4.89)；¹H-NMR (DMSO-*d*₆) δ: 1.11 (3H, t, J=7.6 Hz, C₇-CH₂CH₃), 2.65 (2H, q, J=7.6 Hz, C₇-CH₂CH₃), 2.70 (3H, s, C₁₃-OCH₃), 4.91 (2H, s, H-2), 5.53 (2H, s, H-10), 6.82-6.90 (2H, m, H-15, H-16), 6.97 (1H, d, J=1.6 Hz, H-12), 7.20-7.25 (2H, m, H-14, H-6), 7.48 (1H, s, H-8), 8.09 (1H, d, J=8.1 Hz, H-5)；¹³C-NMR (DMSO-*d*₆) δ: 15.14(C₇-CH₂CH₃), 28.56(C₇-CH₂CH₃), 46.29 (C-10), 55.31 (C₁₃-OCH₃), 76.17 (C-2), 100.26 (C-3a), 113.07 (C-8), 113.21 (C-14), 116.01 (C-12), 118.94 (C-16), 124.73 (C-4a), 124.97 (C-6), 126.92 (C-5), 130.31 (C-15), 136.84 (C-11), 138.50 (C-8a), 150.01 (C-7), 159.80 (C-13), 171.47 (C-9a), 174.79 (C-4), 191.22 (C-3).

***N-p*-Methoxybenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (73) 之合成**

取化合物 **29**(2.29g , 0.01mole)和 *p*-methoxybenzyl chloride(14.3g , 0.1mole) 為原料，比照化合物 **68** 的合成法及處理步驟，得化合物 **73** (2.34g , 67.05 %)，

mp: 241-242 。光譜數據如下: MS m/z : 349; IR (KBr) cm^{-1} : 1705.6 ($\text{C}_3=\text{O}$), 1620.7 ($\text{C}_4=\text{O}$); UV λ_{max} nm (MeOH) ($\log \epsilon$): 249 (4.45); $^1\text{H-NMR}$ ($\text{DMSO-}d_6$) δ : 1.36 (3H, t, $J=7.6$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 2.69 (2H, q, $J=7.6$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 3.69 (3H, s, $\text{C}_{13}\text{-OCH}_3$), 4.92 (2H, s, H-2), 5.49 (2H, s, H-10), 6.89 (2H, d, $J=8.7$ Hz, H-13, H-15), 7.26 (1H, d, $J=8.1$ Hz, H-6), 7.34 (2H, d, $J=8.7$ Hz, H-12, H-16), 7.52 (1H, s, H-8), 8.08 (1H, d, $J=8.1$ Hz, H-5); $^{13}\text{C-NMR}$ ($\text{DMSO-}d_6$) δ : 15.23 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 28.60 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 45.80 (C-10), 55.31 ($\text{C}_{14}\text{-OCH}_3$), 76.12 (C-2), 100.26 (C-3a), 114.44 (C-13, C-15), 116.20 (C-8), 124.91 (C-4a, C-6), 126.92 (C-5, C-11), 128.66 (C-12, C-16), 138.40 (C-8a), 149.96 (C-7), 159.03 (C-14), 171.40 (C-9a), 174.72 (C-4), 191.21 (C-3) .

N-*o*-Chlorobenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (74) 之合成

取化合物 29 (2.29g, 0.01mole) 和 *o*-chlorobenzyl chloride (14.7g, 0.1mole) 為原料, 比照化合物 68 的合成法及處理步驟, 得化合物 74 (1.96g, 55.52%), mp: 223-224 。光譜數據如下: MS m/z : 353; IR (KBr) cm^{-1} : 1721.0 ($\text{C}_3=\text{O}$), 1620.7 ($\text{C}_4=\text{O}$); UV λ_{max} nm (MeOH) ($\log \epsilon$): 249 (4.49); $^1\text{H-NMR}$ ($\text{DMSO-}d_6$) δ : 1.09 (3H, t, $J=7.5$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 2.64 (2H, q, $J=7.5$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 4.88 (2H, s, H-2), 5.59 (2H, s, H-10), 7.06 (1H, d, $J=7.6$ Hz, H-13), 7.24-7.34 (4H, m, H-8, H-14, H-15, H-16), 7.57 (1H, d, $J=8.3$ Hz, H-6), 8.13 (1H, d, $J=8.3$ Hz, H-5); $^{13}\text{C-NMR}$ ($\text{DMSO-}d_6$) δ : 15.19 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 28.52 ($\text{C}_7\text{-CH}_2\text{CH}_3$); 46.62 (C-10), 76.25 (C-2), 100.46 (C-3a), 115.57 (C-8), 124.76 (C-4a), 125.13 (C-6), 127.06 (C-5), 127.60 (C-15), 128.12 (C-14), 129.79 (C-13), 129.97 (C-16), 131.74 (C-12), 132.34 (C-11), 138.51 (C-8a), 150.26 (C-7), 171.48 (C-9a), 175.07 (C-4), 191.08 (C-3) .

N-*m*-Chlorobenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (75) 之合成

取化合物 29 (2.29g, 0.01mole) 和 *m*-chlorobenzyl chloride (14.7g, 0.1mole) 為原料, 比照化合物 68 的合成法及處理步驟, 得化合物 75 (2.21g, 62.60%), mp: 226-238 。光譜數據如下: MS m/z : 353; IR (KBr) cm^{-1} : 1705.6 ($\text{C}_3=\text{O}$), 1613.0 ($\text{C}_4=\text{O}$); UV λ_{max} nm (MeOH) ($\log \epsilon$): 248 (4.65); $^1\text{H-NMR}$ ($\text{DMSO-}d_6$) δ : 1.11 (3H, t, $J=7.6$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 2.62 (2H, q, $J=7.6$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 4.91 (2H, s, H-2), 5.58 (2H, s, H-10), 7.25-7.38 (4H, m, H-6, H-14, H-15, H-16), 7.46 (1H, s, H-12), 7.53 (1H, s, H-8), 8.10 (1H, d, $J=8.1$ Hz, H-5); $^{13}\text{C-NMR}$ ($\text{DMSO-}d_6$) δ : 14.91 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 29.68 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 46.43 (C-10), 75.61 (C-2), 100.43 (C-3a), 114.67 (C-8), 124.24 (C-16), 125.05 (C-4a), 125.36 (C-6), 126.39 (C-5), 128.22 (C-14), 128.68 (C-12), 130.64 (C-15), 135.34 (C-13), 136.01 (C-11), 138.25 (C-8a), 150.63 (C-7), 159.80 (C-13), 172.26 (C-9a), 174.75 (C-4), 190.27 (C-3) .

N-p-Chlorobenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (76) 之合成

取化合物 29 (2.29g , 0.01mole) 和 *p*-chlorobenzyl chloride (14.7g , 0.1mole) 為原料，比照化合物 68 的合成法及處理步驟，得化合物 76 (2.59g , 73.37 %)，mp: 227-228。光譜數據如下：MS *m/z*: 353; IR (KBr) cm^{-1} : 1713.0 ($\text{C}_3=\text{O}$), 1620.7 ($\text{C}_4=\text{O}$); UV λ_{max} nm (MeOH) (log ϵ): 248 (4.77); $^1\text{H-NMR}$ (DMSO- d_6) δ : 1.21 (3H, t, $J=7.6$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 2.66 (2H, q, $J=7.6$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 4.90 (2H, s, H-2), 5.57 (2H, s, H-10), 7.25-7.46 (6H, m, Ar-H, H-6, H-8), 8.10 (1H, d, $J=8.1$ Hz, H-5); $^{13}\text{C-NMR}$ (DMSO- d_6) δ : 15.17 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 28.53 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 45.66 (C-10), 76.13 (C-2), 100.30 (C-3a), 115.94 (C-8), 124.76 (C-4a), 124.94 (C-6), 126.95 (C-5), 128.99 (C-12, C-13, C-15, C-16), 132.61 (C-11), 134.34 (C-14), 138.31 (C-8a), 150.06 (C-7), 171.38 (C-9a), 174.80 (C-4), 191.10 (C-3) .

N-o-Fluorobenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (77) 之合成

取化合物 29 (2.29g , 0.01mole) 和 *o*-fluorobenzyl chloride (13.1g , 0.1mole) 為原料，比照化合物 68 的合成法及處理步驟，得化合物 77 (2.01g , 59.64 %)，mp: 245-246。光譜數據如下：MS *m/z*: 337; IR (KBr) cm^{-1} : 1705.6 ($\text{C}_3=\text{O}$), 1613.0 ($\text{C}_4=\text{O}$); UV λ_{max} nm (MeOH) (log ϵ): 249 (4.55); $^1\text{H-NMR}$ (DMSO- d_6) δ : 1.11 (3H, t, $J=7.5$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 2.65 (2H, q, $J=7.5$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 4.90 (2H, s, H-2), 5.60 (2H, s, H-10), 7.13-7.43 (6H, m, Ar-H, H-6, H-8), 8.10 (1H, d, $J=8.1$ Hz, H-5); $^{13}\text{C-NMR}$ (DMSO- d_6) δ : 14.60 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 28.93 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 40.80 (C-10), 75.42 (C-2), 100.24 (C-3a), 114.28 (C-13), 115.52 (C-11), 115.93 (C-8), 120.77 (C-15), 121.05 (C-14), 124.74 (C-4a), 125.04 (C-6), 127.79 (C-5), 129.99 (C-16), 130.16 (C-12), 137.95 (C-8a), 150.38 (C-7), 172.12 (C-9a), 174.66 (C-4), 190.29 (C-3) .

N-m-Fluorobenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (78) 之合成

取化合物 29 (2.29g , 0.01mole) 和 *m*-fluorobenzyl chloride (13.1g , 0.1mole) 為原料，比照化合物 68 的合成法及處理步驟，得化合物 78 (2.27g , 67.36 %)，mp : 258-260。光譜數據如下：MS *m/z*: 337; IR (KBr) cm^{-1} : 1705.6 ($\text{C}_3=\text{O}$), 1613.0 ($\text{C}_4=\text{O}$); UV λ_{max} nm (MeOH) (log ϵ): 249 (4.84); $^1\text{H-NMR}$ (DMSO- d_6) δ : 1.10 (3H, t, $J=7.5$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 2.65 (2H, q, $J=7.5$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 4.90 (2H, s, H-2), 5.58 (2H, s, H-10), 7.08-7.44 (6H, m, Ar-H, H-6, H-8), 8.09 (1H, d, $J=8.1$ Hz, H-5); $^{13}\text{C-NMR}$ (DMSO- d_6) δ : 15.26 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 28.63 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 45.93 (C-10), 76.27 (C-2), 100.46 (C-3a), 113.94 (C-14), 114.38 (C-12), 114.78 (C-16), 115.21 (C-15), 116.01 (C-8), 123.13 (C-4a), 124.82 (C-6), 125.11 (C-5), 127.06 (C-11), 131.31 (C-13), 138.43 (C-8a), 150.21 (C-7), 171.60 (C-9a), 174.94 (C-4), 191.37 (C-3) .

N-p-Fluorobenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (79) 之合成

取化合物 29 (2.29g , 0.01mole) 和 *p*-fluorobenzyl chloride (13.1g , 0.1mole) 為原料，比照化合物 68 的合成法及處理步驟，得化合物 79 (2.41g , 71.51 %) , mp:238-239 。光譜數據如下: MS *m/z*: 337; IR (KBr) cm^{-1} : 1705.6($\text{C}_3=\text{O}$), 1620.7 ($\text{C}_4=\text{O}$); UV λ_{max} nm (MeOH) (log ϵ): 249 (4.59); $^1\text{H-NMR}$ (DMSO- d_6) δ : 1.12 (3H, t, $J=7.5$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 2.66 (2H, q, $J=7.5$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 4.91 (2H, s, H-2), 5.56(2H, s, H-10), 7.13-7.48 (6H, m, Ar-H, H-6, H-8), 8.09(1H, d, $J=8.1$ Hz, H-5); $^{13}\text{C-NMR}$ (DMSO- d_6) δ : 15.25 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 28.58 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 45.62 (C-10), 76.16 (C-2), 100.33 (C-3a), 115.68 (C-8), 116.09 (C-13, C-15), 124.80 (C-4a), 124.98 (C-6), 126.96 (C-5, C-11), 129.26 (C-16), 129.42 (C-12), 131.50 (C-14), 138.33 (C-8a), 150.06 (C-7), 171.43 (C-9a), 174.80 (C-4), 191.23 (C-3) .

N-o-Nitrobenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (80) 之合成

取化合物 29 (2.29g , 0.01mole) 和 *o*-nitrobenzyl chloride (15.8g , 0.1mole) 為原料，比照化合物 68 的合成法及處理步驟，得化合物 80 (1.48 g , 40.66 %) , mp:222-224 。光譜數據如下: MS *m/z*: 364; IR (KBr) cm^{-1} : 1713.3($\text{C}_3=\text{O}$), 1620.7 ($\text{C}_4=\text{O}$); UV λ_{max} nm (MeOH) (log ϵ): 249 (4.57); $^1\text{H-NMR}$ (DMSO- d_6) δ : 1.06 (3H, t, $J=7.6$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 2.60 (2H, q, $J=7.6$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 4.84 (2H, s, H-2), 5.93 (2H, s, H-10), 5.03-7.07 (1H, m, H-6), 7.30 (1H, d, $J=8.4$ Hz, H-13), 7.42 (1H, s, H-8), 7.58-7.63 (2H, m, H-14, H-15), 8.14 (1H, d, $J=8.1$ Hz, H-5), 8.25-8.29 (1H, m, H-16); $^{13}\text{C-NMR}$ (DMSO- d_6) δ : 15.51 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 28.45 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 45.03 (C-10), 76.21 (C-2), 100.52 (C-3a), 115.98 (C-8), 124.72 (C-4a), 125.05 (C-6), 125.93 (C-5), 127.02 (C-13), 127.16 (C-14), 129.22 (C-16), 130.61 (C-11), 134.94 (C-15), 138.55 (C-8a), 143.34 (C-12), 150.53 (C-7), 171.60 (C-9a), 175.26 (C-4), 191.08 (C-3) .

N-m-Nitrobenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (81) 之合成

取化合物 29 (2.29g , 0.01mole) 和 *m*-nitrobenzyl chloride (15.8g , 0.1mole) 為原料，比照化合物 68 的合成法及處理步驟，得化合物 81 (2.36 g , 64.84 %) , mp:233-235 。光譜數據如下: MS *m/z*: 364; IR (KBr) cm^{-1} : 1705.6($\text{C}_3=\text{O}$), 1613.0 ($\text{C}_4=\text{O}$); UV λ_{max} nm (MeOH) (log ϵ): 249 (4.12); $^1\text{H-NMR}$ (DMSO- d_6) δ : 1.11 (3H, t, $J=7.6$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 2.65 (2H, q, $J=7.6$ Hz, $\text{C}_7\text{-CH}_2\text{CH}_3$), 4.90 (2H, s, H-2), 5.74 (2H, s, H-10), 7.28 (1H, d, $J=8.0$ Hz, H-6), 7.52 (1H, s, H-8), 7.62 (1H, t, $J=8.0$ Hz, H-15), 7.75 (1H, d, $J=7.6$ Hz, H-14), 8.08 (1H, s, H-5), 8.14(1H, d, $J=7.0$ Hz, H-16), 8.36 (1H, s, H-12) ; $^{13}\text{C-NMR}$ (DMSO- d_6) δ : 15.26 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 28.56 ($\text{C}_7\text{-CH}_2\text{CH}_3$), 45.59 (C-10), 76.25 (C-2), 100.48 (C-3a), 115.93 (C-8), 122.29 (C-14), 123.00 (C-4a), 124.78 (C-6), 125.11 (C-12), 127.06 (C-5), 130.72 (C-15), 133.46 (C-16), 137.69 (C-11), 138.31 (C-8a), 148.21 (C-13), 150.30 (C-7), 171.42 (C-9a), 174.97 (C-4), 191.21 (C-3) .

N-p-Nitrobenzyl-7-ethyl-2,3,4,9-tetrahydrofuro[2,3-*b*]quinolin-3,4-dione (82) 之合成

取化合物 **29** (2.29g , 0.01mole) 和 *p*-nitrobenzyl chloride (15.8g , 0.1mole) 為原料，比照化合物 **68** 的合成法及處理步驟，得化合物 **82** (2.89 g , 79.40 %) , mp:248-250 。光譜數據如下: MS *m/z*: 364; IR (KBr) cm^{-1} : 1721.0(C₃=O), 1613.0 (C₄=O); UV λ_{max} nm (MeOH) (log ϵ): 248 (4.75); ¹H-NMR (DMSO-*d*₆) δ : 1.11(3H, t, J=7.6 Hz, C₇-CH₂CH₃), 2.64 (2H, q, J=7.6 Hz, C₇-CH₂CH₃), 4.90 (2H, s, H-2), 5.74 (2H, s, H-10), 7.29 (1H, d, J=8.0 Hz, H-6), 7.43 (1H, s, H-8), 7.64 (2H, d, J=8.4 Hz, H-13, H-15), 8.10-8.22(3H, m, H-5, H-12, H-16); ¹³C-NMR (DMSO-*d*₆) δ : 15.28 (C₇-CH₂CH₃), 28.58(C₇-CH₂CH₃), 45.69(C-10), 76.24(C-2), 100.45(C-3a), 115.86(C-8), 124.14(C-13, C-15), 124.79(C-4a), 125.09(C-6), 127.09(C-5), 128.22 (C-12, C-16), 138.34 (C-11), 143.16 (C-14), 147.27 (C-8a), 150.27 (C-7), 171.48 (C-9a), 174.96 (C-4), 191.15 (C-3) .