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Original scientific paper

Synthesis and characterization of ether linkage containing bis-fluoran compounds

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Abstract: 2'-Chloro-6'-diethylaminofluoran and 2'-chloro-3'-methyl-6'-diethylaminofluoran were reacted with various diphenols in dimethyl formamide in the presence of potassium carbonate to give the related bis-fluoran compounds. All the synthesized derivatives were identified by conventional methods (IR, ^{1}H-NMR), elemental analysis and UV-visible spectroscopy in organic solvent and 95 % acetic acid. All the fluoran compounds change their colour in acidic media.

Keywords: synthesis, bisfluoran compounds, colour change in acidic media.

INTRODUCTION

Fluoran is the commonly used name for spiro[iso-benzofuran-1,9'-xanthen]-3-one. Among the various classes of leuco dyes, fluoran compounds have been used in a variety of fields. These include sublimation transfer printing, thermo indicator, printed circuit writing materials, textile finishing, *etc.*, although recording papers, *i.e.*, carbonless copying paper, and thermo sensitive recording paper are extraordinarily large in volume.[1]

A number of ether linked fluoran compounds, such as 2-phenoxy-6-(*N*-ethyl-*N*-isoamilamino)fluoran,[2] 2-phenoxy-6-diethylaminofluoran,[2] 3,6-dimethoxyfluoran,[3] 3,6-dimethoxy dilactone fluoran,[4] give clear colour images with high density and low fog showing good storage stability while bis-fluoran compounds, such as 7,7-bis(3-diethylaminofluoran),[5] 7,7-bis(3-diethylaminofluoranyl)ketone,[5] 7,7'-sulfonyl-bis(3-diethylaminofluoran),[5] 2',2"-iminobis(6'-diethylamino)fluoran,[6] 2,2-bis{4-[6'-(*N*-cyclohexyl-*N*-methylamino)-3'-methylfluoran-2'-yl-amino]phenyl}propane,[7] 6,6-bis(3-diethylaminofluoran)[8] showed excellent stability upon exposure to light.

In the present study, substantially colourless bisfluoran chromogenic materials having the structural formula were investigated.

The bisfluoran compounds were produced by nucleophilic aromatic substitution of 2'-chloro-6'-diethylaminofluoran,[9] 2'-chloro-3'-methyl-6'–diethylaminofluoran[10] with var-

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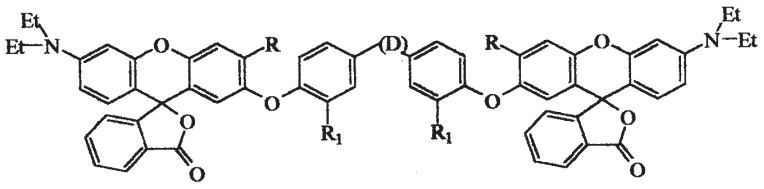

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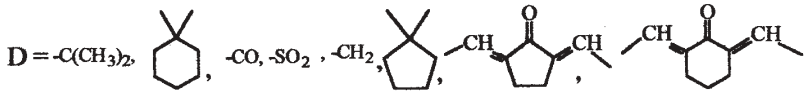
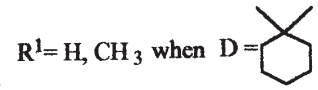


R = H, CH_3 and



ious diphenols in the presence of K_2CO_3. Suitable diphenols include, for example, 4,4'-isopropylidenediphenol (**D_1**), 1,1–bis(4-hydroxyphenyl)cyclohexane[11] (**D_2**), 1,1-bis(4-hydroxy-3-methylphenyl)cyclohexane[11] (**D_3**), 4,4'-dihydroxybenzophenone (**D_4**), 4,4'-sulfonyldiphenol[12] (**D_5**), 4–[1-(4-hydroxyphenyl)cyclopenta-2,4-dienyl]phenol[13] (**D_6**), methylenediphenol (**D_7**), 2,5-bis(4-hydroxybenzylidene)cyclopentanone[14] (**D_8**), 2,6-bis(4-hydroxybenzylidene) cyclohexanone[14] (**D_9**).

EXPERIMENTAL

All melting points (m.p.) are uncorrected and expressed in ºC. The IR spectra were recorded on a Nicolet Impact-400 D FT-IR spectrophotometer using KBr pellets. The ^{1}H-NMR spectra were recorded on a Hitachi R-1500 instrument, using TMS as the internal standard, chemical shifts are given in δ(ppm). The absorption spectra (λ_{max}) of the fluoran compounds in toluene and 95 % acetic acid were recorded on a Shimadzu UV-240 instrument.

*Preparation of bis–fluorans. (**C**)*

General procedure. A mixture of each diphenol (0.01 mol), potassium carbonate (0.022 mol), 2'-chloro-6'-diethylaminofluoran (**A**) and/or 2'-chloro-3'methyl-6'-diethylaminofluoran (**B**) were refluxed in dimethylformamide (50 ml) for several hours (Table I). The reaction progress was monitored by TLC (benzene : methanol 7 : 3). The mixture was hot filtered, washed with 25 ml dimethylformamide (3 portions) and concentrated to the half. Then crushed ice was added and the formed precipitates were filtered and recrystallized from ethanol. The solution of this compound in toluene is colourless while on contact with silica gel a colour is instantaneously formed as shown in Table I.

Elemental analysis, IR(KBr) and ^{1}H-NMR($CDCl_3$)

2,2-Bis{4-[6'-diethylamino-2'-fluoranoxy]phenyl}propane. (**C_1**). Calculated for $C_{63}H_{54}N_2O_8$: C, 78.24; H, 5.63; N, 2.89 % Found: C, 77.74; H, 5.03; N, 2.80 %. IR: 3069, 1360 cm^{-1} (CH_3); 2969, 2938, 2865, 1478 cm^{-1} (N–Et); 1764 cm^{-1} (C=O); 1241 and 1118 cm^{-1} (Ar–O–Ar); 1627, 1600, 1436, 1412, 1283, 829, 697, 561 cm^{-1}. ^{1}H-NMR: 6.46–8.04 (28H, *m*, Ar–H), 3.19–3.53 (8H, *q*, N–(CH_2–CH_3)$_2$), 1.57 (6H, *s*, C–CH_3), 1.05–1.28 (12H, *t*, N–(CH_2–CH_3)$_2$).

1,1-Bis{4-[6'-diethylamino-2'-fluoranoxy]phenyl}cyclohexane. (**C_2**). Calculated for $C_{66}H_{58}N_2O_8$: C, 78.71; H, 5.80; N, 2.78 % Found: C, 78.24; H, 6.45; N, 2.71 %. IR: 2965, 2938, 2865, 1481 cm^{-1} (N–Et);

1770 cm^{-1} (C=O); 1232 and 1118 cm^{-1} (Ar–O–Ar); 1642, 1602, 1535, 1412, 1289, 870, 816, 702, 567 cm^{-1}. ^{1}H-NMR: 6.44–7.84 (28H, *m*, Ar–H), 3.21–3.48 (8H, *q*, N–(*CH_2*–CH_3)$_2$), 2.47–2.53 (4H, *s*, cyclohexane), 1.64–1.70 (4H, *s*, cyclohexane), 1.44–1.48 (2H, *s*, cyclohexane), 1.05–1.28 (12H, *t*, N–(CH_2–*CH_3*)$_2$).

1,1-Bis{4-[6'-diethylamino-2'-fluoranoxy]-3-methylphenyl}cyclohexane. (**C_3**). Caclulated for $C_{68}H_{62}N_2O_8$: C, 78.79; H, 6.04; N, 2.71 % Found: C, 78.26; H, 6.26; N, 2.58 %. IR: 3112, 1363 cm^{-1} (CH_3); 2969, 2930, 2868, 1478 cm^{-1} (N–Et); 1766 cm^{-1} (C=O); 1240 and 1118 cm^{-1} (Ar–O–Ar); 1627, 1608, 1518, 1412, 1270, 1255, 1015, 870, 782, 697, 567 cm^{-1}. ^{1}H-NMR: 6.44–7.99 (26H, *m*, Ar–H), 3.21–3.48 (8H, *q*, N–(*CH_2*–CH_3)$_2$), 2.47–2.53 (4H, *s*, cyclohexane), 2.21 (6H, *s*, Ar–CH_3), 1.64–1.70 (4H, *s*, cyclohexane), 1.44–1.48 (2H, *s*, cyclohexane), 1.05–1.28 (12H, *t*, N–(CH_2–*CH_3*)$_2$).

Bis{4-[6'-diethylamino-2'-fluoranoxy]phenyl}ketone. (**C_4**). Calculated for $C_{61}H_{48}N_2O_9$: C, 78.87; H, 5.08; N, 2.94 % Found: C, 77.92; H, 5.91; N, 3.05 %. IR: 2979, 2945, 2879, 1481 cm^{-1} (N–Et); 1770 cm^{-1} (C=O); 1655 cm^{-1} (C=O); 1232 and 1098 cm^{-1} (Ar–O–Ar); 1635, 1600, 1565, 1417, 1275, 1200, 1187, 1010, 883, 702, 561 cm^{-1}. ^{1}H-NMR: 6.45–8.10 (28H, *m*, Ar–H), 3.19–3.51 (8H, *q*, N–(*CH_2*-CH_3)$_2$), 1.05–1.28 (12H, *t*, N–CH_2–*CH_3*)$_2$).

Bis{4-[6'-diethylamino-2'-fluoranoxy]phenyl}sulfone. (**C_5**). Calculated for $C_{60}H_{48}N_2SO_{10}$: C, 72.86; H, 4.89; N, 2.83 % Found: C, 72.22; H, 4.39; N, 2.90 %. IR: 2985, 2968, 2885, 1474 cm^{-1} (N–Et); 1776 cm^{-1} (C=O); 1242 and 1112 cm^{-1} (Ar–O–Ar); 1635, 1608, 1427, 1273, 1132, 876, 715, 554 cm^{-1}. ^{1}H-NMR: 6.45–7.74 (28H, *m*, Ar–H), 3.19–3.43 (8H, *q*, N–(*CH_2*–CH_3)$_2$), 1.05–1.29 (12H, *t*, N–(CH_2–*CH_3*)$_2$).

Bis{4-[6'-diethylamino-2'-fluoranoxy]phenyl}methane. (**C_6**). Calculated for $C_{61}H_{50}N_2O_8$: C, 78.02; H, 5.37; N, 2.98 % Found: C, 77.56; H, 5.38; N, 2.85 %. IR: 2979, 2959, 2875, 1481 cm^{-1} (N–Et); 1770 cm^{-1} (C=O); 1256 and 1125 cm^{-1} (Ar–O–Ar); 1635, 1600, 1525, 1418, 876, 702, 561 cm^{-1}. ^{1}H-NMR: 6.45–8.06 (28H, *m*, Ar–H), 3.54 (2H, *s*, Ar–CH_2–Ar), 3.21–3.42 (8H, *q*, N–(*CH_2*–CH_3)$_2$), 1.05–1.29 (12H, *t*, N–(CH_2–*CH_3*)$_2$).

1,1-Bis{4-[6'-diethylamino-2'-fluoranoxy]phenyl}cyclopentane. (**C_7**). Calculated for $C_{65}H_{52}N_2O_8$: C, 78.92; H, 5.29; N, 2.83 % Found: C, 78.40; H, 5.73; N, 2.76 %. IR: 3019 cm^{-1} (CH_2); 2985, 2965, 2880, 1488 cm^{-1} (N–Et); 1776 cm^{-1} (C=O); 1259 and 1125 cm^{-1} (Ar–O–Ar); 1642, 1602, 1515, 1420, 1259, 870, 708, 561 cm^{-1}. ^{1}H-NMR: 6.44–8.10 (24H, *m*, Ar–H), 3.21–3.42 (8H, *q*, N–(*CH_2*–CH_3)$_2$), 2.45–2.51 (4H, *s*, cyclopentane), 1.62–1.70 (4H, *s*, cyclopentane), 1.05–1.28 (12H, *t*, N–(CH2–*CH_3*)$_2$).

2,5-Bis{4-[6'-diethylamino-2'-fluoranoxy]benzylidene}cyclopentanone. (**C_8**). Calculated for $C_{67}H_{54}N_2O_9$: C, 78.04; H, 5.28; N, 2.72 % Found: C, 77.05; H, 5.35; N, 2.79 %. IR: 2979, 2957, 2880, 1481 cm^{-1} (N–Et); 1783 cm^{-1} (C=O); 1259 and 1111 cm^{-1} (Ar–O–Ar); 1642, 1609, 1525, 1412, 883, 702, 561 cm^{-1}. ^{1}H-NMR: 6.45–8.06 (28H, *m*, Ar–H), 3.21–3.42 (8H, *q*, N–(*CH_2*–CH_3)$_2$), 3.15–3.17 (4H, *s*, cyclopentanone), 1.95–1.99 (2H, *s*, *CH*), 1.05–1.29 (12H, *t*, N–(CH_2–*CH_3*)$_2$).

2,6-Bis{4-[6'-diethylamino-2'-fluoranoxy]benzylidene}cyclohexanone. (**C_9**). Calculated for $C_{68}H_{56}N_2O_9$: C, 78.14; H, 5.40; N, 2.68 % Found: C, 77.94; H, 5.51; N, 2.57 %. IR: 2985, 2969, 2873, 1474 cm^{-1} (N–Et); 1760 cm^{-1} (C=O); 1225 and 1118 cm^{-1} (Ar–O–Ar); 1635, 1600, 1515, 1412, 876, 702, 561, 476 cm^{-1}. ^{1}H-NMR: 6.45–8.06 (28H, *m*, Ar–H), 3.21–3.42 (8H, *q*, N–(*CH_2*–CH_3)$_2$), 1.91–1.96 (2H, *s*, *CH*), 1.81–1.83 (6H, *m*, cyclohexanone), 1.05–1.29 (12H, *t*, N–(CH_2–*CH_3*)$_2$).

2,2-Bis{4-[6'-diethylamino-3'-methyl-2'-fluoranoxy]phenyl}propane. (**C_{10}**). Calculated for $C_{65}H_{60}N_2O_8$: C, 78.29; H, 6.07; N, 2.81 % Found: C, 77.43; H, 6.84; N, 2.74 %. IR: 3065 cm^{-1} (Ar–CH_3); 2985, 2955, 2875, 1475 cm^{-1} (N–Et); 1770 cm^{-1} (C=O); 1205 and 1111 cm^{-1} (Ar–O–Ar); 1625, 1615, 1521, 1400, 890, 702, 467 cm^{-1}, ^{1}H-NMR: 6.46–8.04 (28H, *m*, Ar–H), 3.19–3.53 (8H, *q*, N–(*CH_2*–CH_3)$_2$), 2.15 (6H, *s*, Ar–*CH_3*), 1.57 (6H, *s*, C–*CH_3*), 1.05–1.28 (12H, *t*, N–(CH_2–*CH_3*)$_2$).

1,1-Bis{4-[6'-diethylamino-3'-methyl-2'-fluoranoxy]phenyl}cyclohexane. (**C_{11}**). Calculated for $C_{68}H_{64}N_2O_8$: C, 78.74; H, 6.12; N, 2.70 % Found: C, 78.15; H, 6.26; N, 2.61 %. IR: 3018 cm^{-1} (Ar–CH_3); 2965, 2958, 2857, 1481 cm^{-1} (N–Et); 1783 cm^{-1} (C=O); 1226 and 1125 cm^{-1} (Ar–O–Ar); 1602, 1512, 1447, 1380, 870, 702, 467 cm^{-1}. ^{1}H-NMR: 6.44–7.84 (28H, *m*, Ar–H), 3.21–3.48 (8H, *q*, N–(*CH_2*–CH_3)$_2$), 2.47–2.53 (4H, *s*, cycloxane), 2.12 (6H, *s*, Ar–*CH_3*), 1.64–1.70 (4H, *s*, cyclohexane), 1.44–1.48 (2H, *s*, cyclohexane), 1.05–1.28 (12H, *t*, N–(CH_2–*CH_3*)$_2$).

1,1-Bis{4-[6'-diethylamino-3'-methyl-2'-fluoranoxy]-3-methylphenyl}cyclohexane. (**C_{12}**). Calculated for $C_{70}H_{68}N_2O_8$: C, 78.92; H, 6.43; N. 2.63 % Found: C, 78.67; H, 5.93; N, 2.56 %. IR: 3102 cm^{-1} (Ar–CH_3); 2979, 2857, 2873, 1479 cm^{-1} (N–Et); 1770 cm^{-1} (C=O); 1219 and 1125 cm^{-1} (Ar–O–Ar); 1622, 1600, 1528,

1414, 1279, 876, 782, 708, 561, 473 cm^{-1}. ^{1}H-NMR: 6.45–8.10 (26H, *m*, Ar–H), 3.21–3.48 (8H, *q*, N–(*CH*$_2$–CH$_3$)$_2$), 2.47–2.53 (4H, *s*, cyclohexane), 2.16 (12H, *s*, Ar–*CH*$_3$), 1.64–1.70 (4H, *s*, cyclohexane), 1.44–1.48 (2H, *s*, cyclohexane), 1.05–1.28 (12H, *t*, N–(CH$_2$–*CH*$_3$)$_2$).

Bis{4-[6'-diethylamino-3'-methyl-2'-fluoranoxy]phenyl}ketone. (**C$_{13}$**). Calculated for $C_{63}H_{54}N_2O_9$: C, 76.97; H, 5.54, N, 2.85 % Found: C, 76.09; H, 5.41; N, 2.98 %. IR: 3082 cm^{-1} (Ar–CH$_3$); 2999, 2978, 2880, 1481 cm^{-1} (N–Et); 1770 cm^{-1} (C=O); 1665 cm^{-1} (C=O); 1212 and 1111 cm^{-1} (Ar–O–Ar); 1639, 1608, 1555, 1414, 897, 755, 467 cm^{-1}. ^{1}H-NMR: 6.54–8.06 (28H, *m*, Ar–H), 3.19–3.42 (8H, *q*, N–(*CH*$_2$–CH$_3$)$_2$), 2.10 (6H, *s*, Ar–*CH*$_3$), 1.05–1.28 (12H, *t*, N–(CH$_2$–*CH*$_3$)$_2$).

*1,1-Bis{4-[6'-diethylamino-3'-methyl-2'-fluoranoxy]phenyl}cyclopentane. (**C$_{14}$**)*. Calculated for $C_{62}H_{54}N_2SO_{10}$: C, 73.07; H, 5.34; N, 2.75 % Found: C, 72.22; H, 5.21; N, 2.66 %. IR: 3095 cm^{-1} (Ar–CH$_3$); 2985, 2877, 2865, 1465 cm^{-1} (N–Et); 1783 cm^{-1} (C=O); 1226 and 1118 cm^{-1} (Ar–O–Ar); 1642, 1608, 1514, 1407, 897, 755, 715, 467 cm^{-1}. ^{1}H-NMR: 6.45–7.74 (28H, *m*, Ar–H), 3.19–3.43 (8H, *q*, N–(*CH*$_2$–CH$_3$)$_2$), 1.18 (6H, *s*, Ar–*CH*$_3$), 1.05–1.29 (12H, *t*, N–(CH$_2$–*CH*$_3$)$_2$).

Bis{4-[6'-diethylamino-3'-methyl-2'-fluoranoxy]phenyl}sulfone. (**C$_{15}$**). Calculated for $C_{63}H_{56}N_2O_8$: C, 78.08; H, 5.82; N, 2.89 % Found: C, 77.88; H, 6.33; N, 2.96 %. IR: 3102 cm^{-1} (Ar–CH$_3$); 2972, 2955, 2869, 1481 cm^{-1} (N–Et); 1776 cm^{-1} (C=O); 1235 and 1125 cm^{-1} (Ar–O–Ar); 1635, 1609, 1525, 1420, 1266, 1195, 1085, 876, 769, 695, 460 cm^{-1}. ^{1}H-NMR: 6.45–8.06 (28H, *m*, Ar–H), 3.54 (2H, *s*, Ar–CH$_2$–Ar), 3.21–3.42 (8H, *q*, N–(*CH*$_2$—CH$_3$)$_2$), 2.07 (6H, *s*, Ar–*CH*$_3$), 1.05–1.29 (12H, *t*, N–(CH$_2$–*CH*$_3$)$_2$).

Bis{4-[6'-diethylamino-3'-methyl-2'-fluoranoxy]phenyl}methane. (**C$_{16}$**). Calculated for $C_{67}H_{58}N_2O_8$: C, 78.96; H, 5.74; N, 2.75 % Found: C, 78.62; H, 5.76; N, 2.79 %. IR: 3088 cm^{-1} (Ar–CH$_3$); 2972, 2958, 2865, 1473 cm^{-1} (N–Et); 1776 cm^{-1} (C=O); 1239 and 1118 cm^{-1} (Ar–O–Ar); 1622, 1600, 1514, 1414, 1059, 883, 769, 702, 460 cm^{-1}. ^{1}H-NMR: 6.44–8.10 (24H, *m*, Ar–H), 3.21–3.42 (8H, *q*, N–(*CH*$_2$–CH$_3$)$_2$), 2.45–2.51 (4H, *s*, cyclopentane), 1.62–1.70 (4H, *s*, cyclopentane), 1.16 (6H, *s*, Ar–*CH*$_3$), 1.05–1.28 (12H, *t*, N–(CH$_2$–*CH*$_3$)$_2$).

2,5-Bis{4-[6'-diethylamino-3'-methyl-2'-fluoranoxo]benzylidene}cyclopentane. (**C$_{17}$**). Calculated for $C_{69}H_{60}N_2O_9$: C, 78.09; H, 5.70; N, 2.64 % Found: C, 77.84; H, 5.11; N, 2.75 %. IR: 3102 cm^{-1} (Ar–CH$_3$); 2972, 2953, 2859, 1463 cm^{-1} (N–Et); 1750 cm^{-1} (C=O); 1226 and 1118 cm^{-1} (Ar–O–Ar); 1622, 1600, 1528, 1420, 1068, 870, 782, 706, 561, 460 cm^{-1}. ^{1}H-NMR: 6.45–8.06 (28H, *m*, Ar–H), 3.3–3.5 (4H, *s*, cyclopentanone), 3.21–3.42 (8H, *q*, N–(*CH*$_2$–CH$_3$)$_2$), 2.20 (6H, *s*, Ar–*CH*$_3$), 1.93–1.99 (2H, *s*, *CH*), 1.05–1.29 (12H, *t*, N–(CH$_2$–*CH*$_3$)$_2$).

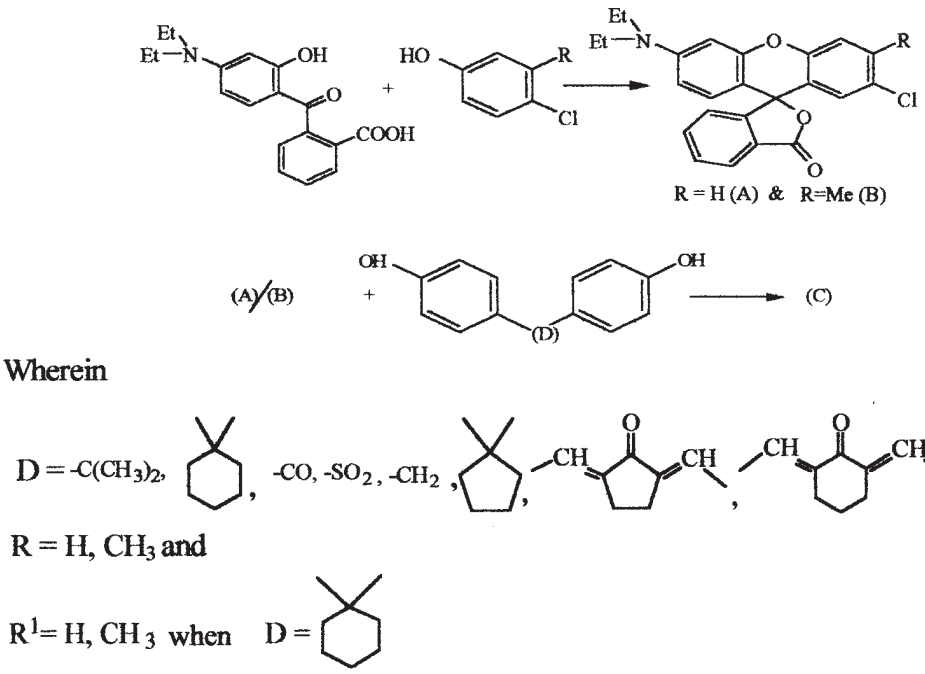
2,6-Bis{4-[6'-diethylamino-3'-methyl-2'-fluoranoxy]benzylidene}cyclohexanone. (**C$_{18}$**). Calculated for $C_{70}H_{62}N_2O_9$: C, 78.19; H, 5.81; N, 2.61 % Found: C, 77.98; H, 6.2; N, 2.74 %. IR: 3069 cm^{-1} (Ar–CH$_3$); 2975, 2958, 2865, 1479 cm^{-1} (N–Et); 1760 cm^{-1} (C=O); 1220 and 1108 cm^{-1} (Ar–O–Ar); 1630, 1602, 1515, 1425, 1082, 876, 702, 467 cm^{-1}. ^{1}H-NMR: 6.45–8.06 (28H, *m*, Ar–H), 3.21–3.42 (8H, *q*, N–(*CH*$_2$–CH$_3$)$_2$), 2.21 (6H, *s*, Ar–*CH*$_3$), 1.93–1.99 (2H, *s*, *CH*), 1.79 (6H, *m*, cyclohexanone), 1.05–1.29 (12H, *t*, N–(CH$_2$–*CH*$_3$)$_2$).

RESULTS AND DISCUSSION

Scheme 1 outlines the synthesis of the fluoran compounds (**C**). All the fluoran compounds (**C**) were characterized by elemental analysis as well as IR, ^{1}H-NMR and UV spectroscopy.

The IR spectra of the fluoran compounds showed the disappearance of the characteristic absorption band of the OH group, Cl group and the appearance of the ether group and other characteristic absorption bands for the rest of the molecules.

The absorption maxima in toluene and 95 % acetic acid of all the fluoran compounds (**C**) are shown in Table I. The existance of one peak in the spectrum of fluoran in toluene is due to the lactone form while the three peaks in 95 % acetic acid are due to the quinone, zwitterions and lactone form as reported previously.[15,16] The solutions of these com-



Scheme 1.

pounds in toluene were colourless but contact with silica gel leads to the instantaneous formation of the colour shown in Table I. This is due to the acidic nature of silica gel. The same colour appears with citric acid.

CONCLUSION

The chromogenic compounds of the present investigation are highly soluble in organic solvents leading to the formation of colourless solutions. Coloured solutions are formed in aqueous acidic solvents and when the organic solutions are contacted with acidic colour activating substances. Methyl substitution at the 3-position of the fluoran compound gave a more bathochromic shift compared to the unsubstituted fluoran compounds.

TABLE I. Physical data of the fluoran compounds (**C**)

Comp. No.	Chloro fluoran	Diphenol	Reaction time/h	Yield/%	M. p./ºC	λ_{max}/nm Toluene	λ_{max}/nm Acetic acid	Colour on silica
$\mathbf{C_1}$	**A**	$\mathbf{D_1}$	4	61	167–70	288	498; 372; 295	Red
$\mathbf{C_2}$	**A**	$\mathbf{D_2}$	5	76	74–76	289	499; 372; 301	Red
$\mathbf{C_3}$	**A**	$\mathbf{D_3}$	4.5	77	94–96	289	499; 372; 302	Red
$\mathbf{C_4}$	**A**	$\mathbf{D_4}$	4.5	71	78–81	288	498; 372; 303	Red
$\mathbf{C_5}$	**A**	$\mathbf{D_5}$	5	71	174–77	287	498; 372; 302	Red
$\mathbf{C_6}$	**A**	$\mathbf{D_6}$	4.5	73	168–71	287	498; 388; 316	Red
$\mathbf{C_7}$	**A**	$\mathbf{D_7}$	5	72	139–42	288	498; 372; 302	Red
$\mathbf{C_8}$	**A**	$\mathbf{D_8}$	4	67	170–72	288	498; 376; 302	Red
$\mathbf{C_9}$	**A**	$\mathbf{D_9}$	4	65	155–57	289	499; 372; 301	Red
$\mathbf{C_{10}}$	**B**	$\mathbf{D_1}$	4	66	145–47	288	531; 376; 302	Purple
$\mathbf{C_{11}}$	**B**	$\mathbf{D_2}$	5	75	155–56	286	532; 375; 317	Purple
$\mathbf{C_{12}}$	**B**	$\mathbf{D_3}$	4.5	77	123–26	288	532; 376; 320	Purple
$\mathbf{C_{13}}$	**B**	$\mathbf{D_4}$	4.5	77	155–57	288	532; 376; 305	Purple
$\mathbf{C_{14}}$	**B**	$\mathbf{D_5}$	5	71	216–18	289	534; 375; 319	Purple
$\mathbf{C_{15}}$	**B**	$\mathbf{D_6}$	4.5	73	138–41	289	533; 375; 323	Purple
$\mathbf{C_{16}}$	**B**	$\mathbf{D_7}$	5	72	164–66	287	531; 376; 306	Purple
$\mathbf{C_{17}}$	**B**	$\mathbf{D_8}$	4	73	110–13	288	531; 376; 322	Purple
$\mathbf{C_{18}}$	**B**	$\mathbf{D_9}$	4	73	146–48	288	532; 375; 315	Purple

ИЗВОД

СИНТЕЗА И КАРАКТЕРИЗАЦИЈА БИС-ФЛУОРАН ЈЕДИЊЕЊА СА ЕТАРСКОМ ВЕЗОМ

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Проучаване су реакције 2′-хлоро-6′-диетиламино-флуорана и 2′-хлоро-3′-метил-6′-диетиламино-флуорана са различитим дифенолима у диметилформамиду у присуству калијум-карбоната, а којима су добијена одговарајућа бис-флуоран једињења. Сва синтетизована једињења идентификована су конвенционалним методама (IR, ^{1}H-NMR), елементалном анализом и UV-видљивом спектроскопијом у органском растварачу и 95 % сирћетној киселини. Сва флуоранска једињења мењају боју у киселој средини.

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