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Murakami et al.

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[54] **ELECTROPHOTOGRAPHIC MATERIAL CONTAINING SENSITIZERS**

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[73] Assignee: **Matsushita Electric Industrial Co., Ltd.,** Osaka, Japan

[22] Filed: **Aug. 7, 1974**

[21] Appl. No.: **495,520**

Related U.S. Patent Documents

Reissue of:

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Filed: **Mar. 5, 1971**

[30] **Foreign Application Priority Data**

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Mar. 13, 1970 Japan 45-21767

[52] **U.S. Cl.** ..... **96/1.6;** 260/327 R; 260/345.2
[51] **Int. Cl.²** **G03G 5/06**
[58] **Field of Search** 96/1.5, 1.6, 1.7; 252/501; 260/327, 345.2

[56] **References Cited**

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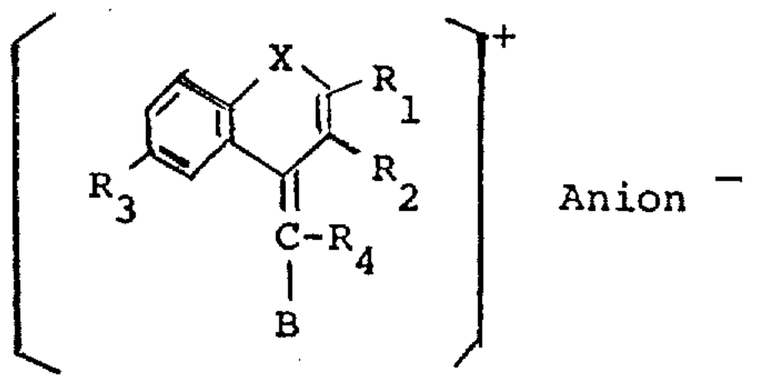
Primary Examiner—Norman G. Torchin
Assistant Examiner—Judson R. Hightower
Attorney, Agent, or Firm—Wenderoth, Lind & Ponack

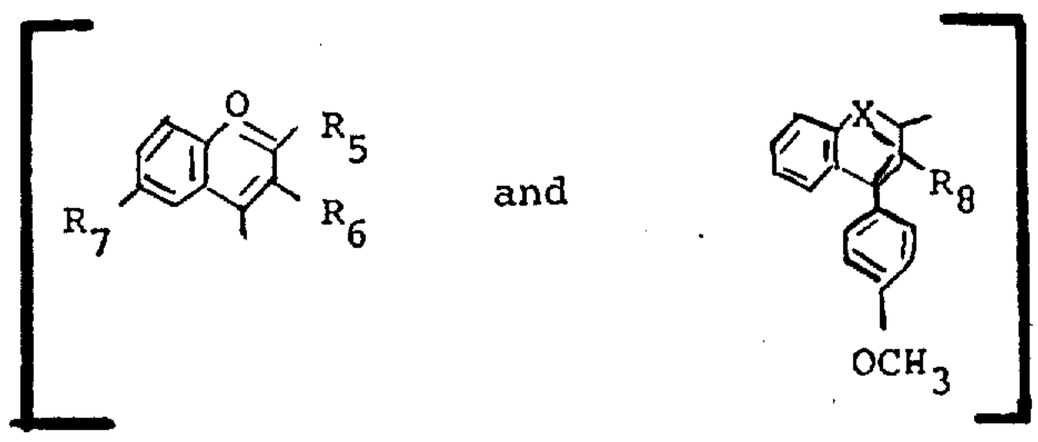
[57] **ABSTRACT**

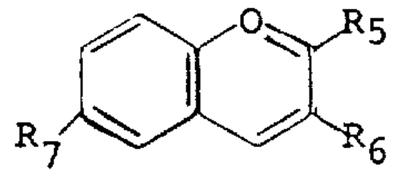
An electrophotographic material is provided herein which comprises a conductive support layer and a photoconductive insulating layer, the latter layer comprising a photoconductive polymeric compound such as poly-N-vinylcarbazole, and a sensitizer having the following general formula



wherein

B represents a radical selected from the group consisting of





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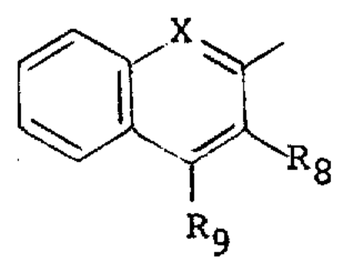
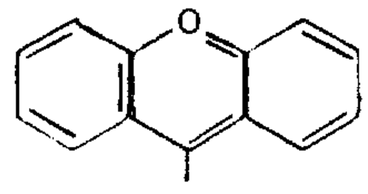


and



Compounds falling under the latter general formula include such compounds as 2-phenyl-4-[(2′-phenyl-4′-benzopyranylidene) benzyl]-benzopyrylium perchlorate and 2,3-phenyl-4-[(2′-phenyl 4′-benzopyranylidene)benzyl]-6-methylbenzopyrylium perchlorate.

3 Claims, 9 Drawing Figures

FIG. 1

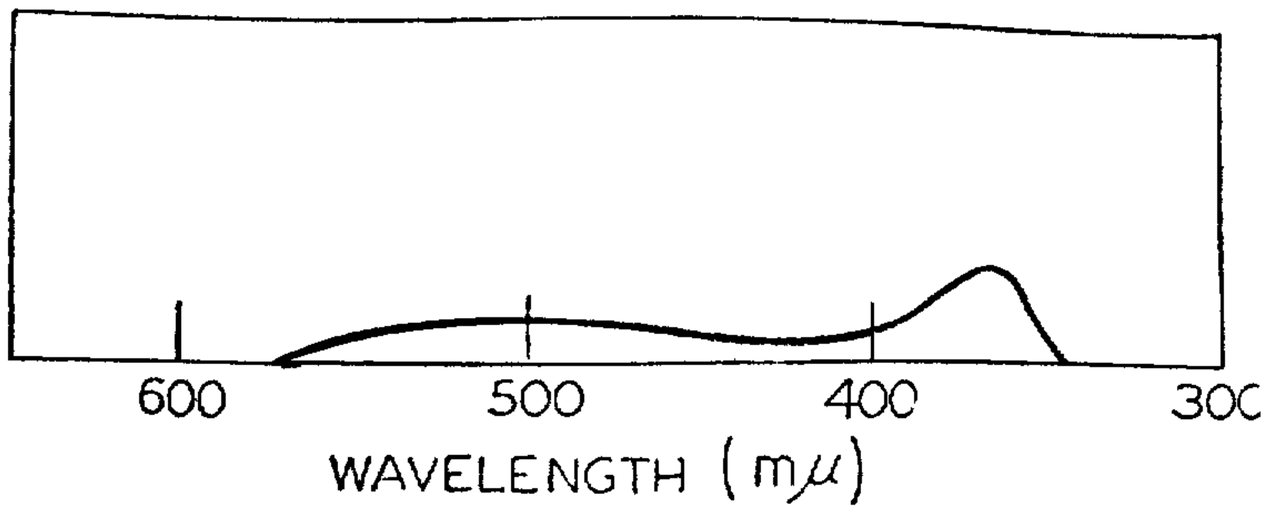


FIG. 2

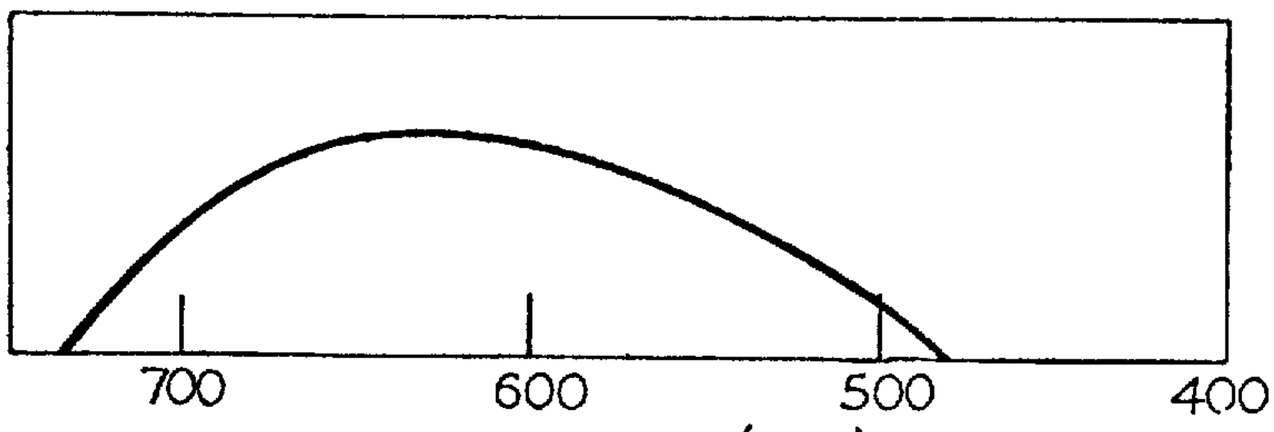


FIG. 3

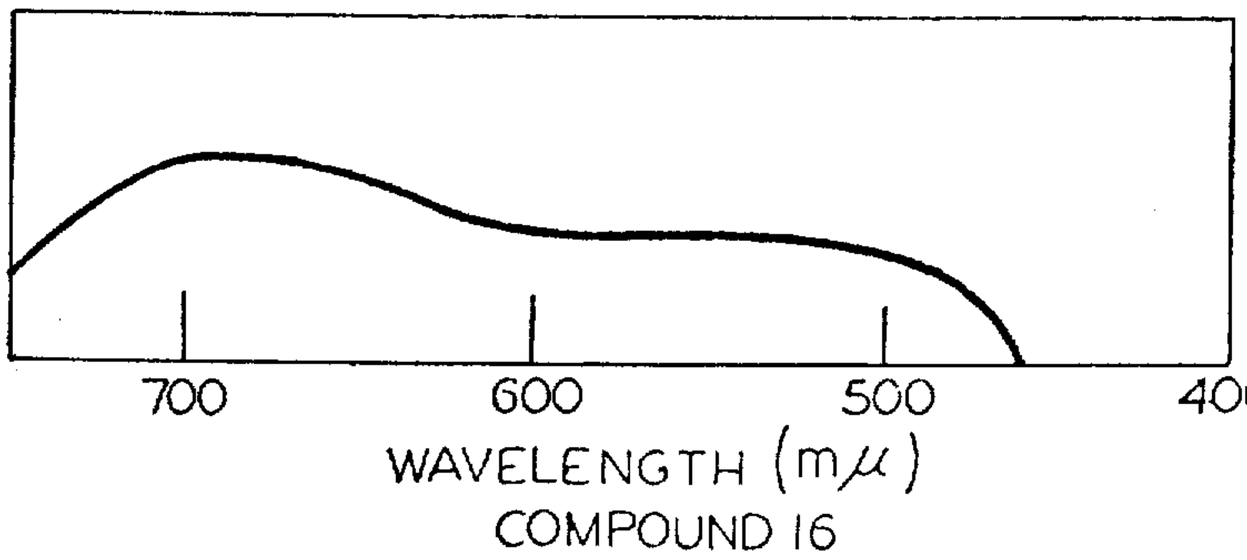


FIG. 4

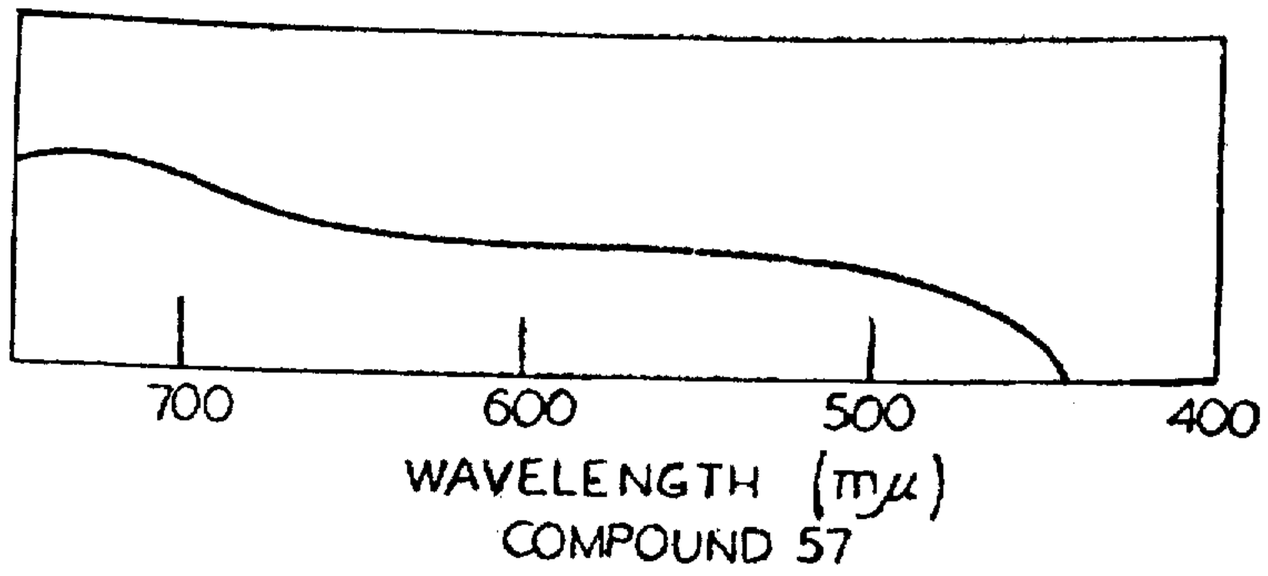


FIG. 5

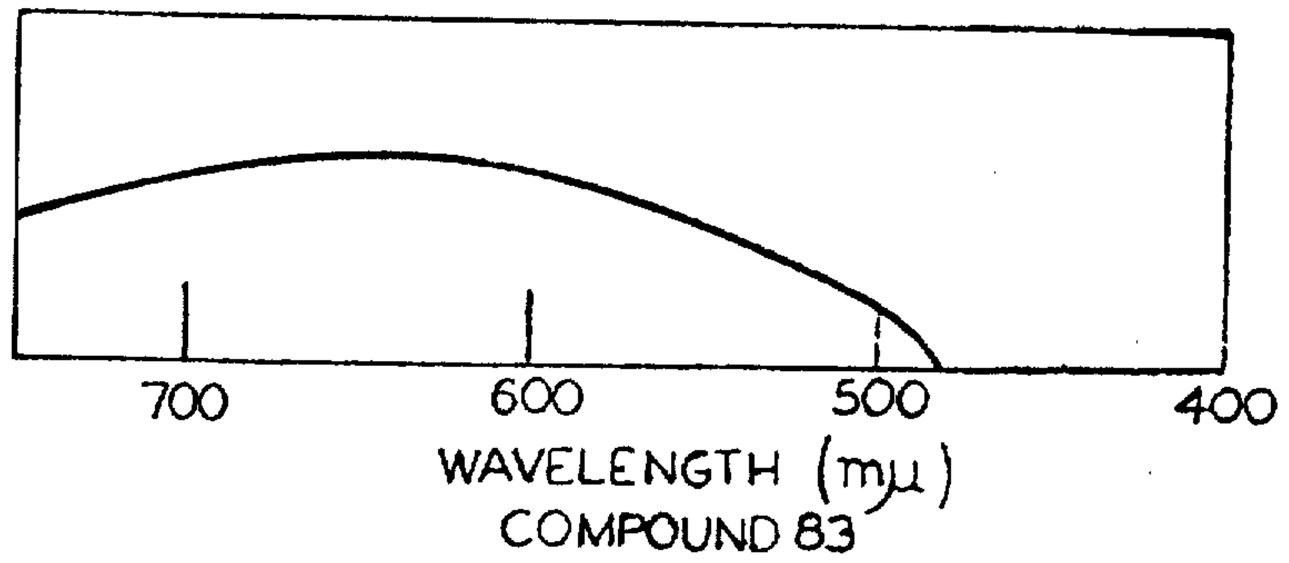


FIG. 6

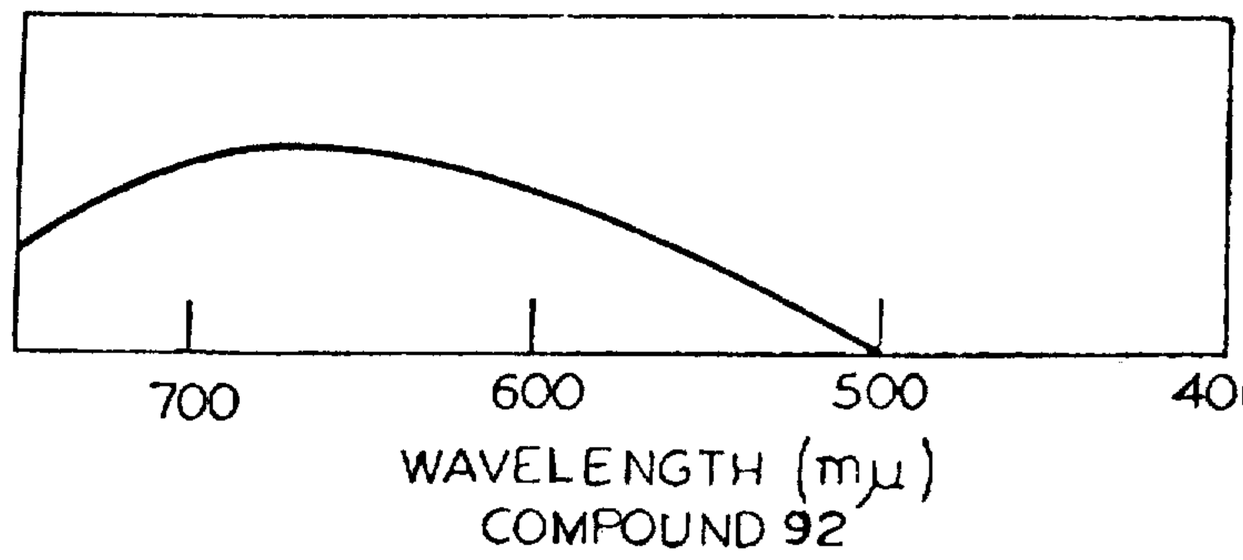


FIG.7

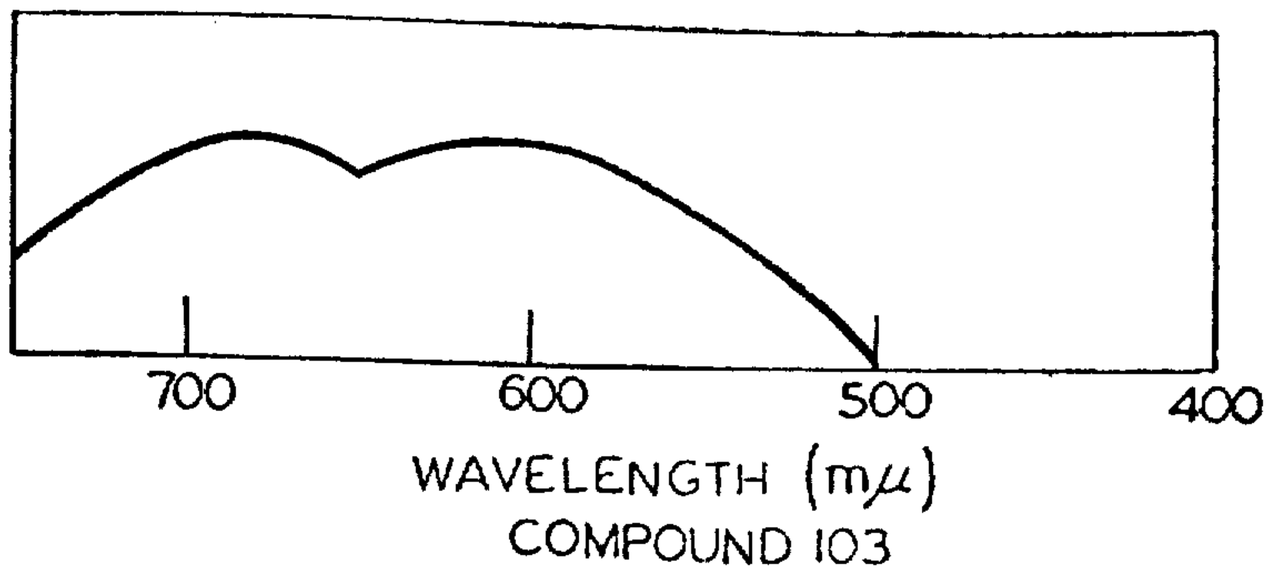


FIG.8

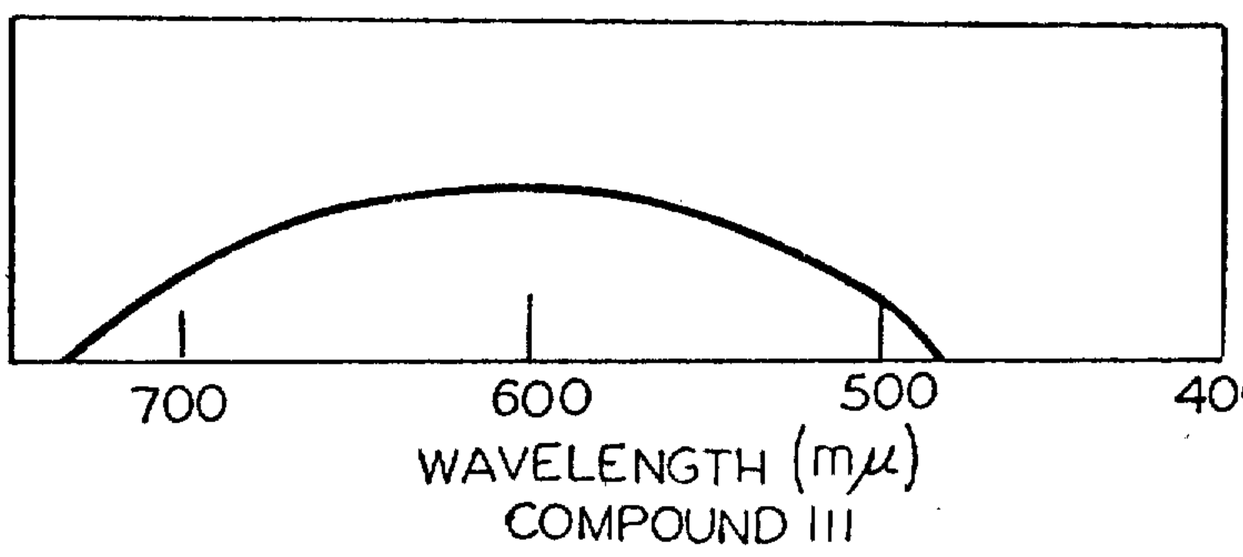
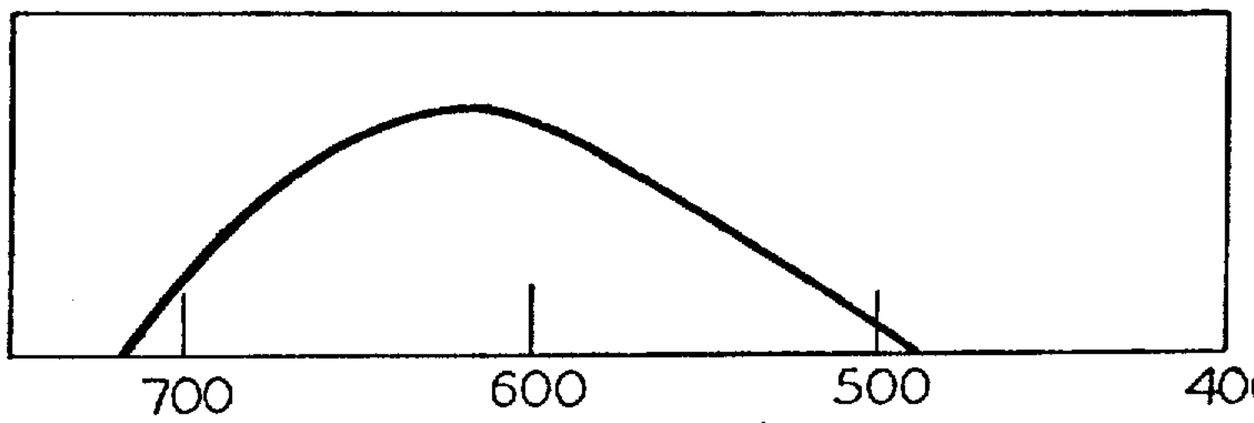


FIG.9



ELECTROPHOTOGRAPHIC MATERIAL CONTAINING SENSITIZERS

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

This invention relates to novel light-sensitive layers and more particularly to electrophotographic light-sensitive polymer layers.

Various light-sensitive layers are well known in the electrophotographic art for making copies of documents, drawings, transparencies, etc. These layers contain organic photoconductive compounds, such as poly-N-vinylcarbazole, brominated poly-N-vinylcarbazoles, polyacenaphthylene, etc. These layers are non-conductors of electricity before exposure and become electrical conductors upon exposure.

It is necessary for the electrophotographic art that the photoconductive material has a high photoconductivity in the long wavelength region of the visible spectrum. Such a photoconductive material makes it possible for the electrophotograph art to employ inexpensive and convenient light sources such as incandescent lamps in a reduced exposure time and to reproduce colored pictures. The photoconductive materials mentioned above, however, have usually a low photoconductivity and spectrum characteristics sensitive to the short wavelength region of the exposure light and do not satisfy entirely the above requirement.

It is known that an addition of a so-called sensitizer can improve photoconductivity and spectrum characteristics of the above photoconductive compounds. Conventional sensitizers are dyestuff compounds, such as triarylmethane dyes, xanthene dyes, triazine dyes or acridine dyes, but the conventional sensitizers are not entirely satisfactory to improve the photoconductivity and the spectrum characteristics of the available photoconductive compounds.

In addition to the high photoconductivity and spectrum characteristics sensitive to visible light, the electrophotographic art requires a high electric resistance of photoconductive materials in the dark. Conventional sensitizers are apt to increase the dark conductivity whereas they promote the photoconductivity. A high dark conductivity of photoconductive materials is not desirable because it results in a loss of the applied electrostatic charge in the dark.

An object of the invention is to provide electrophotographic materials having a high photoconductivity and spectrum characteristics sensitive to a long wavelength region of the visible spectrum.

Another object of the invention is to provide electrophotographic materials having a high electric resistance in the dark.

These and other objects are accomplished by adding a new sensitizer shown hereinafter to a photoconductive polymeric compound such as poly-N-vinylcarbazole, brominated poly-N-vinylcarbazole or polyacenaphthylene, as a light-sensitive film-forming composition.

The invention is further explained in the following description with reference to the accompanying drawings wherein:

FIG. 1 represents the wedge spectrogram for an electrophotographic material coated with an unsensitized solution of 10 weight percent of brominated poly-N-vinylcarbazole in chlorobenzene.

FIG. 2 represents the wedge spectrogram for an electrophotographic material coated with a solution containing 10 weight percent of brominated poly-N-vinylcarbazole sensitized with 0.04 weight percent of 2-(α-phenyl-p-methoxystyryl)-4-[(2′-phenyl-4′-benzopyranylidene)-methyl]benzopyrylium perchlorate, the brominated poly-N-vinylcarbazole being dissolved in a solvent of four weight parts of chlorobenzene and one weight part of dichloroethane.

FIG. 3 represents the wedge spectrogram for an electrophotographic material coated with a solution containing 10 weight percent of brominated poly-N-vinylcarbazole sensitized with 0.04 weight percent of 2-styryl-3-phenyl-4-[(2′-styryl-4′-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate, the brominated poly-N-vinylcarbazole being dissolved in a solvent of four weight parts of chlorobenzene and one weight part of dichloroethane.

FIG. 4 represents the wedge spectrogram for an electrophotographic material coated with a solution containing 10 weight percent of brominated poly-N-vinylcarbazole sensitized with 0.04 weight percent of 2-p-methoxystyryl-4-[2′-α-phenyl-p-methoxystyryl-4′-benzopyranylidene)methyl]benzopyrylium perchlorate, the brominated poly-N-vinylcarbazole being dissolved in a solvent of four weight parts of chlorobenzene and one weight part of dichloroethane.

FIG. 5 represents the wedge spectrogram for an electrophotographic material coated with a solution containing 10 weight percent of brominated poly-N-vinylcarbazole sensitized with 0.04 weight percent of 2-p-methoxystyryl-4-[(2′-phenyl-4′-benzothiopyranylidene)-methyl]benzopyrylium perchlorate, the brominated poly-N-vinylcarbazole being dissolved in a solvent of four weight parts of chlorobenzene and one weight part of dichloroethane.

FIG. 6 represents the wedge spectrogram for an electrophotograph material coated with a solution containing 10 weight percent of brominated poly-N-vinyl carbazole sensitized with 0.04 weight percent of 2-[(2′-phenyl-4′-benzopyranylidene)methyl]3-phenylbenzopyrylium perchlorate, the brominated poly-N-vinylcarbazole being dissolved in a solvent of four parts of chlorobenzene and one weight part of dichloroethane.

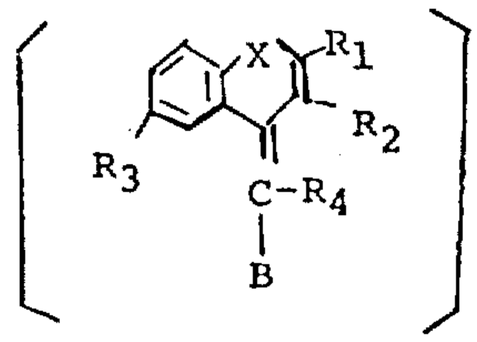
FIG. 7 represents the wedge spectrogram for an electrophotographic material coated with a solution containing 10 weight percent of brominated poly-N-vinylcarbazole sensitized with 0.04 weight percent of 2-[(4′-benzothiopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate, the brominated poly-N-vinylcarbazole being dissolved in a solvent of four weight parts of chlorobenzene and one weight part of dichloroethane.

FIG. 8 represents the wedge spectrogram for an electrophotographic material coated with a solution containing 10 weight percent of brominated poly-N-vinylcarbazole sensitized with 0.04 weight percent of 2-[(2′-α-phenyl-p-methoxystyryl-4′-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate, the brominated poly-N-vinylcarbazole being dissolved in a solvent of four weight parts of chlorobenzene and one weight part of dichloroethane.

FIG. 9 represents the wedge spectrogram for an electrophotographic material coated with a solution con-

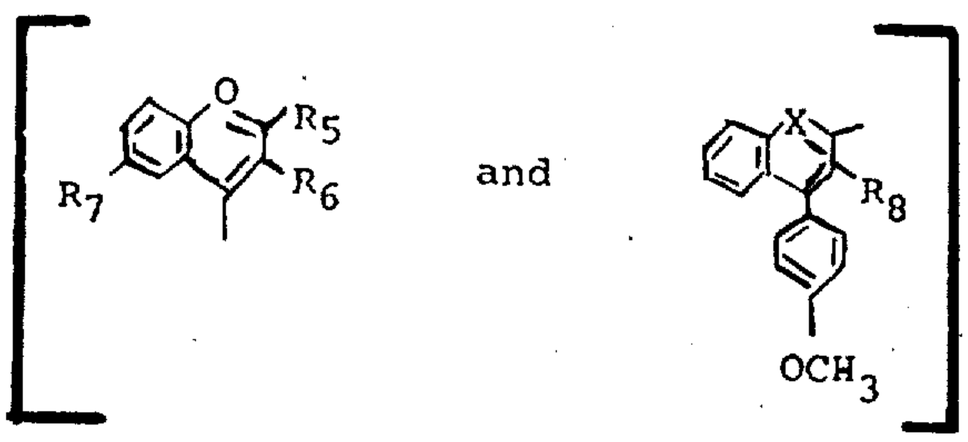
aining 10 weight percent of brominated poly-N-vinyl-:arbazole sensitized with 0.04 weight percent of 2-[(2'-)henyl-4'-benzothiopyranylidene)methyl]-3-phenyl-)enzopyrylium perchlorate, the brominated poly-N-'inylcarbazole being dissolved in a solvent of four veight parts of chlorobenzene and one weight part of lichloroethane.

The new sensitizer, according to the present inven-ion has the following formula:

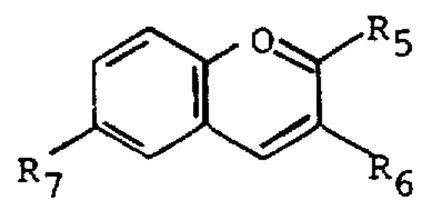


Anion$^-$

here B represents a radical selected from the group onsisting of,



and



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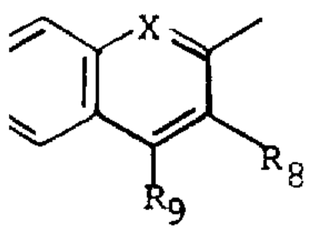
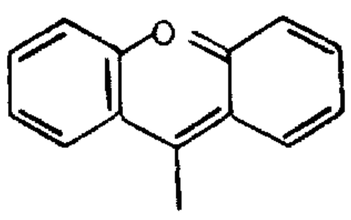


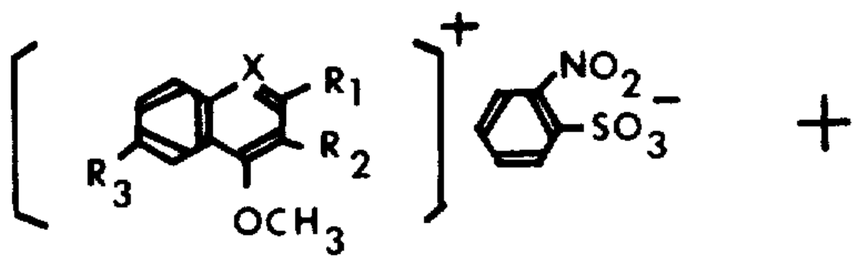
and



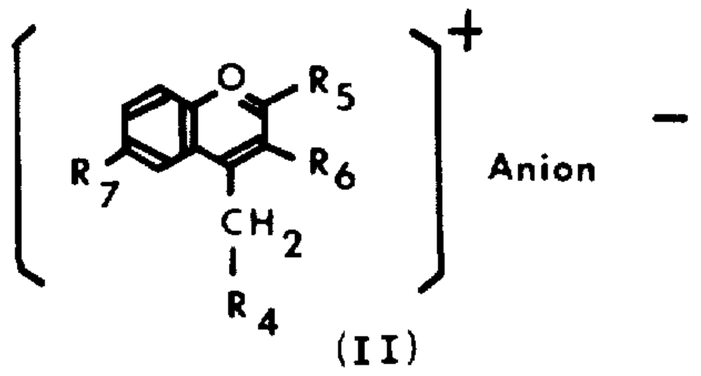
$_1$ is hydrogen, phenyl or an ethenyl or an ethenyl radical selected from the group consisting of styryl,p-methoxystyryl, 3,4-dimethoxystyryl, α-phenylstyryl, α-phenyl-p-methoxystyryl, β-furyl(α')ethenyl and α-phenyl-β-furyl(α')-ethenyl;
$_2$ is hydrogen or phenyl;
$_3$ is hydrogen, methyl or phenyl;
$_4$ is hydrogen or phenyl;
$_5$ is hydrogen, phenyl or an ethenyl radical selected from the group consisting of styryl, p-methoxystyryl, 3,4-dimethoxystyryl, α-phenyl-p-methoxystyryl, β-furyl(α')ethenyl and α-phenyl-β-furyl(α')ethenyl;
$_6$ is hydrogen or phenyl;
$_7$ is hydrogen, methyl or phenyl;
$_8$ is hydrogen or phenyl;
$_9$ *is hydrogen or p-methoxyphenyl;*
e anion is anionic function selected from the group onsisting of perchlorate, fluoroborate, chloroferrate, ilorozincate and nitrate; and
is oxygen or sulfur atom.

The sensitizers having the formula above mentioned e prepared by the following chemical equations A or

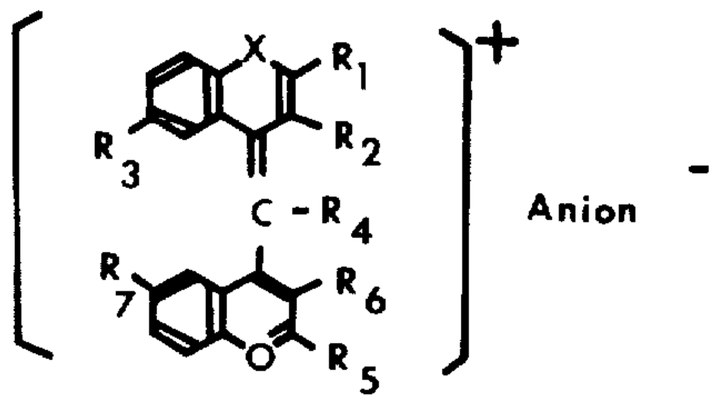
Equation A



(I)



(II)

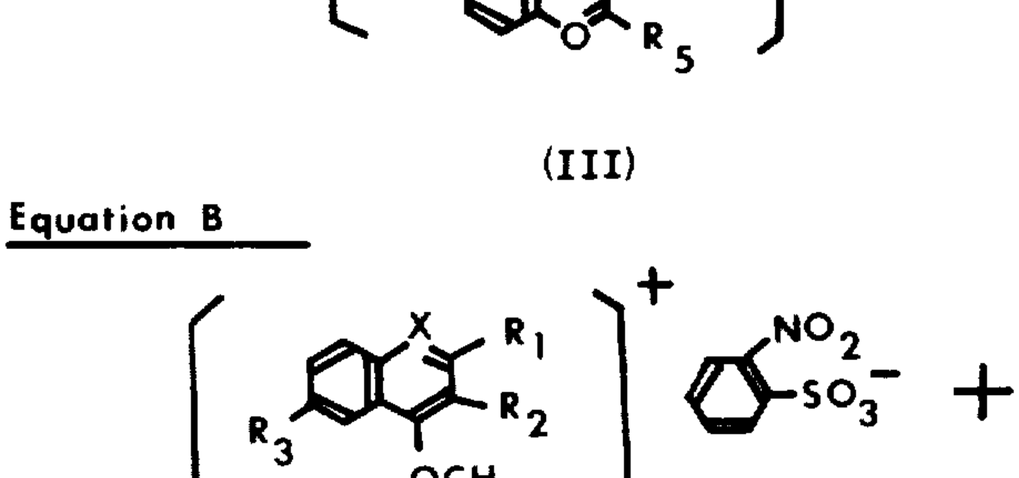


(III)

Equation B

(I)

(IV)



(V)

In the case of Equation A, 4-[(4'-benzopyranylidene)-methyl]benzopyrylium derivative (III) is obtained by an addition reaction of 4-methoxybenzopyrylium o-nitrobenzene sulfonate (I) with a benzopyrylium salt (II) in an acetic anhydride solution. The benzopyrylium salt has an active methyl or methylene radical.

In the case of Equation B, 2-[(4'-benzopyranylidene)-methyl]benzopyrylium derivative (V) is obtained by an addition reaction of 4-methoxyben-

zopyrylium o-nitrobenzene sulfonate (I) with a benzopyrylium salt (IV) in an acetic anhydride solution. The benzopyrylium salt has an active methyl radical.

In both cases, methyl 2,4-dinitrobenzene sulfonate, dimethyl sulfate or methyl iodide can be used instead of methyl o-nitrobenzene sulfonate.

Representative examples of the benzopyranylidenemethylbenzopyrylium salts and benzothiopyranylidene-methylbenzopyrylium salts according to the invention are listed in Table I.

Table 1

Compound Number	Name of Compound
1.	2-phenyl-4-[(2'-phenyl-4'-benzopyranylidene)benzyl]-benzopyrylium perchlorate
2.	2,3-diphenyl-4-[(2'-phenyl-4'-benzopyranylidene)-benzyl]-6-methylbenzopyrylium perchlorate
3.	2,3-diphenyl-4-[(2'-phenyl-4'-benzopyranylidene)-methyl]-6-methylbenzopyrylium perchlorate
4.	2,3-diphenyl-4-[(2'-phenyl-4'-benzopyranylidene)-methyl]-6-phenylbenzopyrylium perchlorate
5.	2-p-methoxystyryl-4-[(2'-phenyl-4'-benzopyranylidene)-methyl]benzopyrylium perchlorate
6.	2-β-furyl(α')ethenyl-4-[(2'-phenyl-4'-benzopyranylidene-methyl]benzopyrylium perchlorate
7.	2-(α-phenyl-p-methoxystyryl)-4-[(2'-phenyl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
8.	2-styryl-3-phenyl-4-[(2'-phenyl-4'-benzopyranylidene)-methyl]-6-methylbenzopyrylium perchlorate
9.	2-p-methoxystyryl-3-phenyl-4-[(2'-phenyl-4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
10.	9-[(2'-phenyl-4'-benzopyranylidene)methyl]xanthylium perchlorate
11.	2-β-furyl(α')ethenyl-3-phenyl-4-[(2'-phenyl-4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
12.	2,3-diphenyl-4-[(2'-styryl-4'-benzopyranylidene)benzyl]-6-methylbenzopyrylium perchlorate
13.	2-phenyl-4-[(2'-styryl-4'-benzopyranylidene)benzyl]benzopyrylium perchlorate
14.	2,3-diphenyl-4-[(2'-styryl-4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
15.	2-(α-phenyl-p-methoxystyryl)-4-[(2'-styryl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
16.	2-styryl-3-phenyl-4-[(2'-styryl-4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
17.	9-[(2'-styryl-4'-benzopyranylidene)methyl]xanthylium perchlorate
18.	2-p-methoxystyryl-3-phenyl-4-[(2'-styryl-4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
19.	2,3-diphenyl-4-[(4'-benzopyranylidene)benzyl]-benzopyrylium perchlorate
20.	2-phenyl-4-[(4'-benzopyranylidene)benzyl]benzopyrylium perchlorate
21.	2,3-diphenyl-4-[(4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
22.	2-(α-phenyl-p-methoxystyryl)-4-[(4'-benzopyranylidene)-methyl]benzopyrylium perchlorate
23.	2-styryl-3-phenyl-4-[(4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
24.	2-p-methoxystyryl-3-phenyl-4-[(4'-benzopyranylidene)-methyl]-6-methylbenzopyrylium perchlorate
25.	9-[(4'-benzopyranylidene)methyl]xanthylium perchlorate
26.	2-p-methoxystyryl-4-[(4'-benzopyranylidene)methyl]-benzopyrylium perchlorate
27.	2-p-methoxystyryl-4-[(2'-p-methoxystyryl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
28.	2-(α-phenyl-p-methoxystyryl)-4-[(2'-p-methoxystyryl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
29.	2-styryl-3-phenyl-4-[(2'-p-methoxystyryl-4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
30.	2,3-diphenyl-4-[(2'-p-methoxystyryl-4'-benzopyranylidene)-methyl]-6-methylbenzopyrylium perchlorate
31.	2,3-diphenyl-4-[(2'-p-methoxystyryl-4'-benzopyranylidene)benzyl]-6-methylbenzopyrylium perchlorate
32.	2-phenyl-4-[(2'-p-methoxystyryl-4'-benzopyranylidene)-benzyl]benzopyrylium perchlorate
33.	9-[(2'-p-methoxystyryl-4'-benzopyranylidene)methyl]-xanthylium perchlorate
34.	2-p-methoxystyryl-4-[(4'-benzothiopyranylidene)methyl]-benzopyrylium perchlorate
35.	2-(α-phenyl-p-methoxystyryl)-4-[(4'-benzothiopyranylidene)-methyl]benzopyrylium perchlorate
36.	2-styryl-3-phenyl-4-[(4'-benzothiopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
37.	2,3-diphenyl-4-[(4'-benzothiopyranylidene)methyl]-6-methylbenzopyrylium perchlorate

Table 1-continued

Compound Number	Name of Compound
38.	2,3-diphenyl-4-[(4'-benzothiopyranylidene)benzyl]-6-methylbenzopyrylium perchlorate
39.	2-phenyl-4-[(4'-benzothiopyranylidene)benzyl]benzopyrylium perchlorate
40.	9-[(4'-benzothiopyranylidene)methyl]xanthylium perchlorate.
41.	2-p-methoxystyryl-3-phenyl-4-[(4'-benzothiopyranylidene)-methyl]-6-methylbenzopyrylium perchlorate
42.	2-p-methoxystyryl-4-[(2'-3'',4''-dimethoxystyryl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
43.	2-styryl-3-phenyl-4-[(2'-3'',4''-dimethoxystyryl-4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
44.	9-[(2'-3'',4''-dimethoxystyryl-4'-benzopyranylidene)-methyl]xanthylium perchlorate
45.	2-phenyl-4-[(2'-β-furyl(α')ethenyl-4'-benzopyranylidene)-benzyl]benzopyrylium perchlorate
46.	2,3-diphenyl-4-[(2'-β-furyl(α')ethenyl-4'-benzopyranylidene)benzyl]-6-methylbenzopyrylium perchlorate
47.	2,3-diphenyl-4-[(2'-β-furyl(α')ethenyl-4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
48.	2-p-methoxystyryl-4-[(2'-β-furyl(α')ethenyl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
49.	2-(α-phenyl-p-methoxystyryl)-4-[(2'-β-furyl(α')ethenyl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
50.	9-[(2'-β-furyl(α')ethenyl-4'-benzopyranylidene)methyl]-xanthylium perchlorate
51.	2-phenyl-4-[(2'-α-phenylstyryl-4'-benzopyranylidene)-benzyl]benzopyrylium perchlorate
52.	2-p-methoxystyryl-4-[(2'-α-phenylstyryl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
53.	2-(α-phenyl-p-methoxystyryl)-4-[(2'-α-phenylstyryl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
54.	2-phenyl-4-[(2'-α-phenyl-p-methoxystyryl-4'-benzopyranylidene)benzyl]benzopyrylium perchlorate
55.	2,3-diphenyl-4-[(2'-α-phenyl-p-methoxystyryl-4'-benzopyranylidene)benzyl] -6-methylbenzopyrylium perchlorate
56.	2,3-diphenyl-4-[(2'-α-phenyl-p-methoxystyryl-4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
57.	2-p-methoxystyryl-4-[(2'-α-phenyl-p-methoxystyryl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
58.	2-(α-phenyl-p-methoxystyryl)-4-[(2'-α-phenyl-p-methoxystyryl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
59.	9-[(2'-α-phenyl-p-methoxystyryl-4'-benzopyranylidene)-methyl]xanthylium perchlorate
60.	2-p-methoxystyryl-4-[(2'-α-phenyl-β-furyl(α')ethenyl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
61.	9-[(2'-α-phenyl-β-furyl(α')ethenyl-4'-benzopyranylidene)methyl]xanthylium perchlorate
62.	2-phenyl-4-[(2'-p-methoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)benzyl]benzopyrylium perchlorate
63.	2,3-diphenyl-4-[(2'-p-methoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)benzyl]-6-methylbenzopyrylium perchlorate
64.	2,3-diphenyl-4-[(2'-p-methoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
65.	2-p-methoxystyryl-4-[(2'-p-methoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
66.	2-(α-phenyl-p-methoxystyryl)-4-[(2'-p-methoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
67.	9-[(2'-p-methoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]xanthylium perchlorate
68.	2-phenyl-4-[(2'-3'',4''-dimethoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)benzyl]benzopyrylium perchlorate
69.	2,3-diphenyl-4-[(2'-3'',4''-dimethoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)benzyl]-6-methylbenzopyrylium perchlorate
70.	2,3-diphenyl-4-[(2'-3'',4''-dimethoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl] -6-methylbenzopyrylium perchlorate
71.	2-p-methoxystyryl-4-[(2'-3'',4''-dimethoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
72.	2-(α-phenyl-p-methoxystyryl)-4-[(2'-3'',4''-dimethoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]-benzopyrylium perchlorate
73.	9-[(2'-3'',4''-dimethoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]xanthylium perchlorate
74.	2-phenyl-4-[(2'-β-furyl(α')ethenyl-3'-phenyl-6'-methyl-4'-benzopyranylidene)benzyl]benzopyrylium perchlorate
75.	2,3-diphenyl-4-[(2'-β-furyl (α')ethenyl-3'-phenyl-6'-methyl-4'-benzopyranylidene)-benzyl]-6-methylbenzopyrylium perchlorate

Table 1-continued

Compound Number	Name of Compound
76.	2,3-diphenyl-4-[(2'-β-furyl(α')ethenyl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
77.	2-p-methoxystyryl-4-[(2'-β-furyl(α')ethenyl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
78.	2-(α-phenyl-p-methoxystyryl)-4-[(2'-β-furyl(α')ethenyl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]-benzopyrylium perchlorate
79.	9-[(2'-β-furyl(α')ethenyl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]xanthylium perchlorate
80.	2-phenyl-4-[(2'-phenyl-4'-benzothiopyranylidene)benzyl]-benzopyrylium perchlorate
81.	2,3-diphenyl-4-[(2'-phenyl-4'-benzothiopyranylidene)-benzyl]-6-methylbenzopyrylium perchlorate
82.	2,3-diphenyl-4-[(2'-phenyl-4'-benzothiopyranylidene)-methyl]-6-methylbenzopyrylium perchlorate
83.	2-p-methoxystyryl-4-[(2'-phenyl-4'-benzothiopyranylidene)methyl]benzopyrylium perchlorate
84.	2-(α-phenyl-p-methoxystyryl)-4-[(2'-phenyl-4'-benzothiopyranylidene)methyl]benzopyrylium perchlorate
85.	2-p-methoxystyryl-3-phenyl-4-[(2'-phenyl-4'-benzothiopyranylidene)methyl] -6-methylbenzopyrylium perchlorate
86.	2-styryl-3-phenyl-4-[(2'-phenyl-4'-benzothiopyranylidene)methyl]-6-methylbenzopyrylium perchlorate
87.	9-[(2'-phenyl-4'-benzothiopyranylidene)methyl]xanthylium perchlorate
88.	2-(α-phenyl-p-methoxystyryl)-4-[(2'-phenyl-4'-benzopyranylidene)methyl]benzopyrylium fluoborate
89.	2-(α-phenyl-p-methoxystyryl)-4-[(2'-phenyl-4'-benzopyranylidene)methyl]benzopyrylium chloroferrate
90.	2-(α-phenyl-p-methoxystyryl)-4-[(2'-phenyl-4'-benzopyranylidene)methyl]benzopyrylium chlorozincate
91.	2-[(2'-phenyl-4'-benzopyranylidene)methyl]-benzopyrylium perchlorate
92.	2-[(2'-phenyl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate
93.	2-[(2'-phenyl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium fluoborate
94.	2-[(2'-phenyl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium chloroferrate
95.	2-[(2'-phenyl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium nitrate
96.	2-[(2'-styryl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
97.	2-[(2'-styryl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate
98.	2-[(4'-benzopyranylidene)methyl]benzopyrylium perchlorate
99.	2-[(4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate
100.	2-[(2'-p-methoxystyryl-4'-benzopyranylidene)methyl]-benzopyrylium perchlorate
101.	2-[(2'-p-methoxystyryl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate
102.	2-[(4'-benzothiopyranylidene)methyl]benzopyrylium perchlorate
103.	2-[(4'-benzothiopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate
104.	2-[(2'-3'',4''-dimethoxystyryl-4'-benzopyranylidene)-methyl]benzopyrylium perchlorate
105.	2-[(2'-3'',4''-dimethoxystyryl-4'-benzopyranylidene)-methyl]-3-phenylbenzopyrylium perchlorate
106.	2-[(2'-β-furyl(α')ethenyl-4'-benzopyranylidene)methyl]-benzopyrylium perchlorate
107.	2-[(2'-β-furyl(α')ethenyl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate
108.	2-[(2'-α-phenylstyryl-4'-benzopyranylidene)methyl]-benzopyrylium perchlorate
109.	2-[(2'-α-phenylstyryl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate
110.	2-[(2'-α-phenyl-p-methoxystyryl-4'-benzopyranylidene)-methyl]benzopyrylium perchlorate
111.	2-[(2'-α-phenyl-p-methoxystyryl-4'-benzopyranylidene)-methyl]-3-phenylbenzopyrylium perchlorate
112.	2-[(2'-α-phenyl-β-furyl(α')ethenyl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate
113.	2-[(2'-p-methoxystyryl-3',6'-diphenyl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate
114.	2-[(2'-3'',4''-dimethoxystyryl-3',6'-diphenyl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate
115.	2-[(2'-p-methoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
116.	2-[(2'-p-methoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl] 3-phenylbenzopyrylium perchlorate
117.	2-[(2'-3'',4'',-dimethoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate

Table 1-continued

Compound Number	Name of Compound
118.	2-[(2'-3'',4''-dimethoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate
119.	2-[(2'-β-furyl(α')ethenyl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate
120.	2-[(2'-β-furyl(α')ethenyl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate
121.	2-[(2'-phenyl-4'-benzothiopyranylidene)methyl]benzopyrylium perchlorate
122.	2-[(2'-phenyl-4'-benzothiopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate
123.	2-[(2'-phenyl-4'-benzopyranylidene)methyl]-4-p-methoxyphenylbenzothiopyrylium perchlorate
124.	2-[(2'-phenyl-4'-benzopyranylidene)methyl]-3-phenyl-4-p-methoxyphenylbenzopyrylium perchlorate
125.	2-[(2'-α-phenyl-p-methoxystyryl-4'-benzopyranylidene)-methyl]-4-p-methoxyphenylbenzothiopyrylium perchlorate
126.	2-[(2'-α-phenyl-p-methoxystyryl-4'-benzopyranylidene)-methyl]-3-phenyl-4-p-methoxyphenylbenzothiopyrylium perchlorate
127.	2-[(2'-phenyl-4'-benzothiopyranylidene)methyl]-4-p-methoxyphenylbenzothiopyrylium perchlorate
128.	2-[(2'-phenyl-4'-benzothiopyranylidene)methyl]-3-phenyl-4-p-methoxyphenylbenzothiopyrylium perchlorate

Table 2 lists additional information on the absorption maximum in dichloroethane and melting point of the novel compounds according to the invention.

Table 2

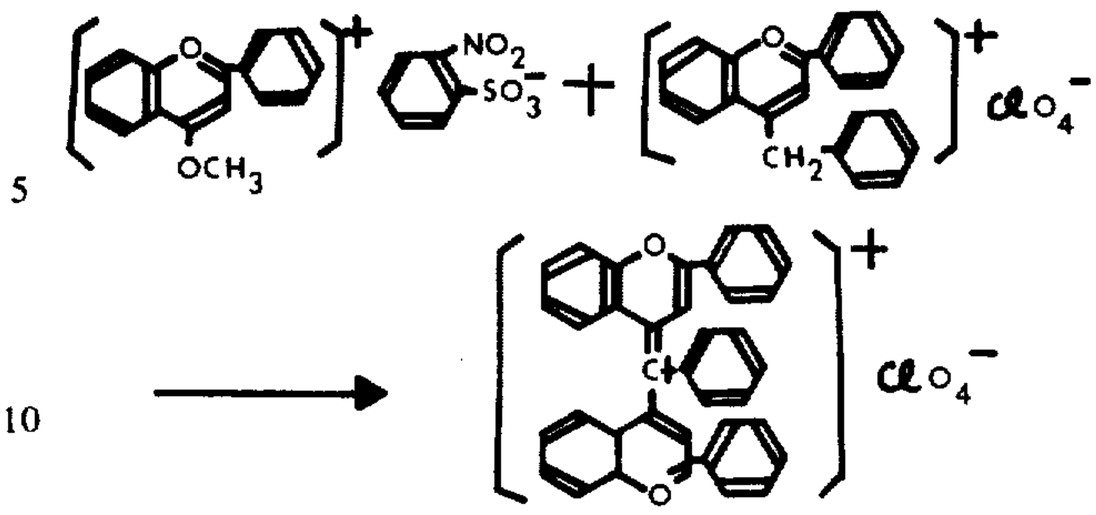
Compound Number	Melting Point	Absorption Maximum in dichloroethane (mμ)
1	135~139	415 and 710
2	130~132	430 and 720
3	182~187	410 and 630
4	164~170	635
5	163~172	490 and 575
6	>300	575 and 660
7	162~169	500 and 610
8	180~187	490 and 670
9	157~160	550 and 670
10	103~105	610
11	120~126	595
12	176~180	430 and 700
13	122~126	420 and 730
14	163~170	420 and 650
15	160~164	500 and 600
16	166~169	495 and 710
17	135~140	580
18	159~162	555
19	179~181	420 and 730
20	140~142	415 and 730
21	165~172	410 and 700
22	174~178	500 and 600
23	176~179	485
24	170~175	505
25	>300	630
26	>300	560
27	191~197	560
28	201~203	500 and 590
29	200~204	660 and 710
30	185~189	410 and 650
31	178~183	430 and 690
32	181~188	420 and 700
33	117~123	550 and 650
34	185~189	590
35	159~164	495 and 600
36	185~188	610, 650 and 700
37	160~165	415 and 650
38	204~206	425 and 700
39	166~169	415 and 730
40	>300	660
41	173~180	555
42	175~181	540 and 600
43	167~173	660 and 710
44	161~164	580 and 720
45	145~150	415 and 720
46	188~190	425 and 720
47	168~175	670
48	171~176	490 and 580
49	179~186	600 and 720
50	171~175	610 and 660
51	151~155	480 and 740
52	171~176	495 and 580
53	173~177	590 and 700
54	140~147	550 and 750
55	203~207	420 and 680

Table 2-continued

Compound Number	Melting Point	Absorption Maximum in dichloroethane (mμ)
56	138~ 142	555 and 680
57	170~175	570
58	154~157	585 and 690
59	168~174	570
60	206~209	600
61	>300	650
62	139~146	550
63	202~204	425 and 700
64	173~177	530 and 690
65	190~194	590
66	190~193	500 and 600
67	192~195	620
68	112~118	570 and 760
69	190~192	495
70	154~159	650 and 700
71	177~182	500 and 710
72	176~181	590
73	195~199	495 and 640
74	189~195	550
75	184~187	415 and 720
76	192~196	640 and 700
77	>300	550
78	219~222	550
79	226~230	630
80	127~134	410 and 745
81	190~192	425 and 730
82	156~159	665
83	164~169	600 and 680
84	175~ 178	600 and 720
85	170~177	550 and 700
86	157~166	650 and 695
87	169~172	635
88	137~140	500 and 610
89	167~172	500 and 610
90	160~163	500 and 610
91	>300	575
92	128~134	575 and 675
93	133~136	575 and 675
94	152~158	575 and 675
95	133~138	575
96	190~195	575
97	156~158	620 and 690
98	225~229	565
99	183~187	525 and 560
100	208~212	570
101	170~176	630 and 690
102	225~228	610
103	163~168	610 and 690
104	178~184	510
105	172~175	580 and 690
106	167~171	565 and 620
107	190~194	560 and 635
108	211~214	570 and 610
109	175~179	570 and 610
110	198~201	570 and 610
111	158~163	580 and 630
112	>300	600 and 645
113	185~188	570 and 620
114	199~204	600
115	211~215	565 and 600
116	177~181	570 and 610
117	205~207	570
118	190~194	590
119	237~241	560
120	>300	590
121	207~210	565 and 605
122	155~158	615 and 675
123	143~145	615
124	126~131	619
125	144~148	559 and 657
126	140~142	589 and 663
127	149~153	656
128	141~145	660

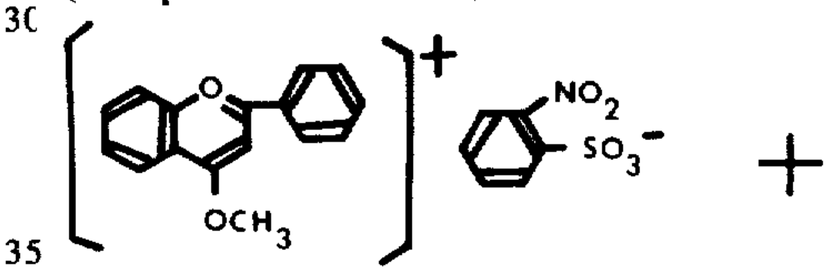
The following description will explain a practical method for making benzopyranylidene-methylbenzopyrylium salts or benzothiopyranylidene-methylbenzopyrylium salts with reference to exemplary compounds. The details of the preparation of other compounds will be apparent to the skilled in the art from the preceding disclosure and the following illustrative examples of preparation methods of various compounds according to the invention:

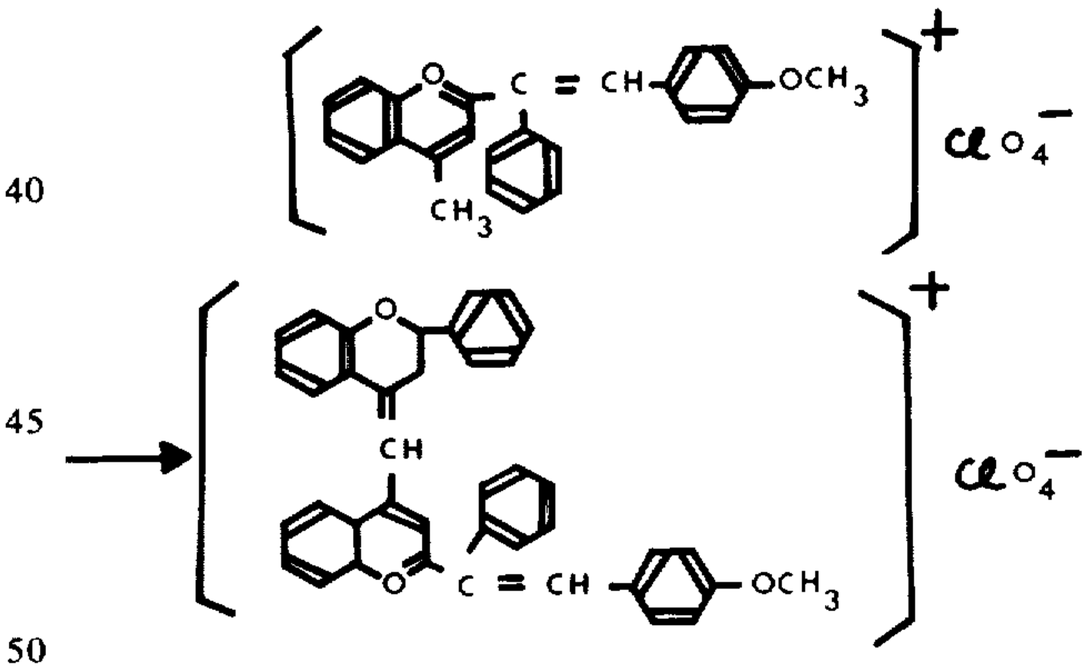
(a) 2-phenyl-4-[(2'-phenyl-4'-benzopyranylidene)-benzyl]benzopyrylium perchlorate (compund number 1)



5.5 Grams of 2-phenyl-4-methoxybenzopyrylium o-nitrobenzene sulfonate, which is obtained from flavone and methyl o-nitrobenzenesulfonate, and 5 grams of 2-phenyl-4-benzylbenzopyrylium perchlorate are dissolved in 150 milliliters of acetic anhydride to a solution. The solution is then refluxed for 15 minutes and poured into 900 milliliters of 10 weight percent perchloric acid. The solution is filtered to obtain a precipitate. The precipitate is dried and dissolved again in dichloroethan to a solution. For purification the solution is poured into ether. Precipitated crystals are filtered off, washed with ether and dried to obtain 4 grams (theoretical yield 53%) of green crystals having a melting point of 135° to 139° C.

(b) 2-(α-phenyl-p-methoxystyryl)-4-[(2'-phenyl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate (compound number 7)

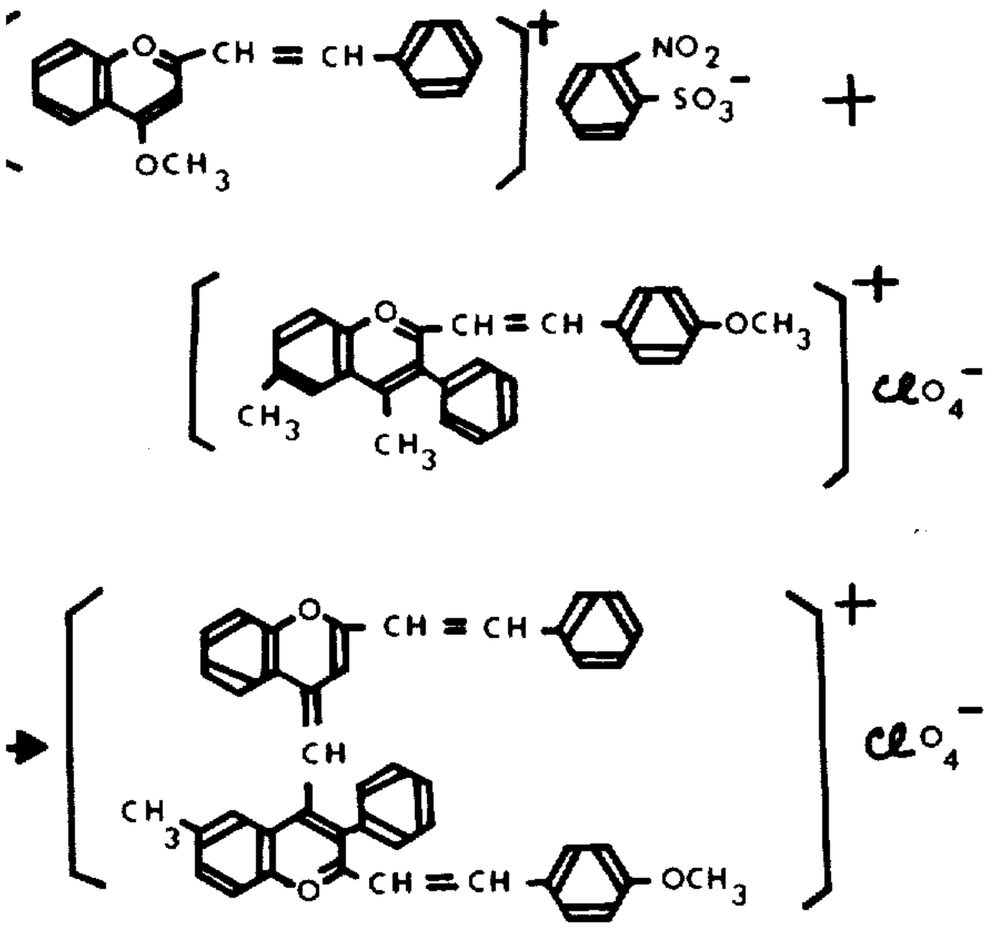




5.5 grams of 2-(α-phenyl-p-methoxystyryl)-4-methylbenzopyrylium perchlorate and 5.5 grams of 2-phenyl-4-methoxybenzopyrylium o-nitrobenzene sulfonate are dissolved in 150 milliliters of acetic anhydride to a solution. The solution is then refluxed for 15 minutes and poured into 900 milliliters of 10 weight percent perchloric acid. The solution is filtered to obtain a precipitate. The precipitate is reprecipitated with dichloroethane ether. Precipitated crystals are filtered off, washed with ether and dried to obtain 5.5 grams (theoretical yield 69%) of blue crystals having a melting point of 162° to 169°C. In the procedure above mentioned the solution ios poured into an ether solution of $BF_3.O(C_2H_5)_2$ instead of 10 weight percent perchloric acid. In this case 2-(α-phenyl-p-methoxystyryl)-4-[(2'-phenyl-4'-benzopyranylidene)methyl]benzopyrylium fluoroborate (compound number 88) is obtained. In the procedure when the solution is poured into a 10 weight percent zinc chloride aqueous solu-

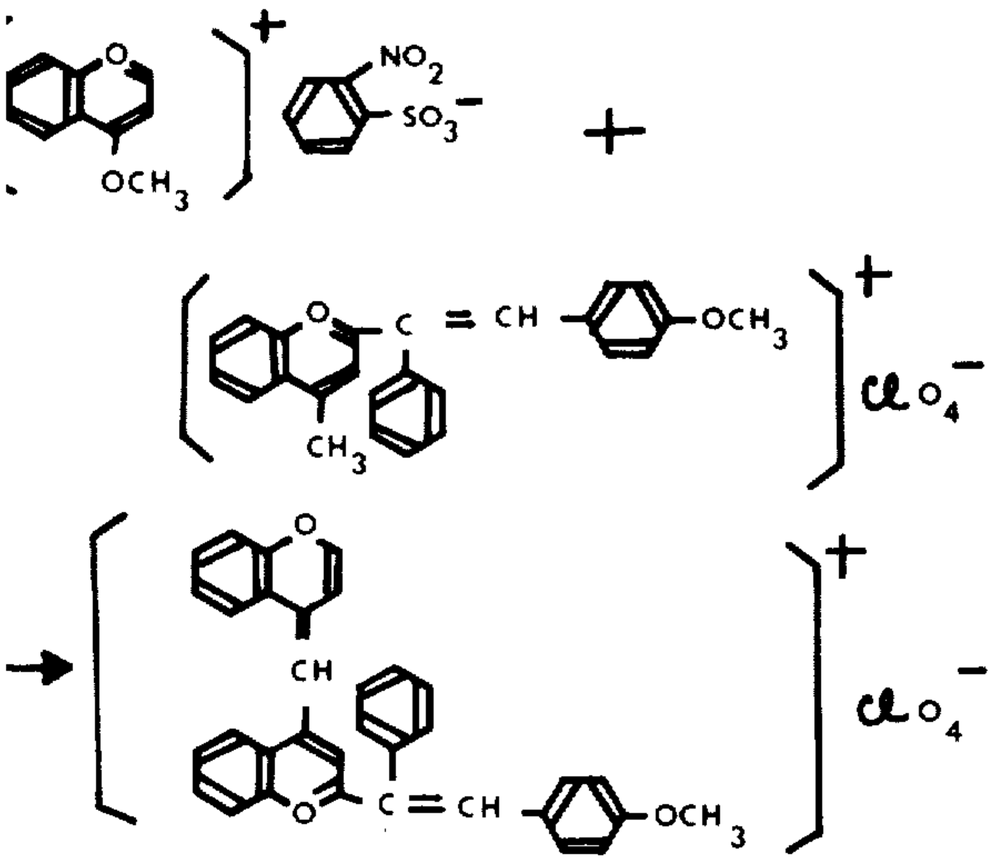
tion, 2-(α-phenyl-p-methoxystyryl)-4-[(2'-phenyl-4'-benzopyranylidene)-methyl]benzopyrylium chlorozincate (compound number 90) is obtained.

(c) 2-p-methoxystyryl-3-phenyl-4-[(2'-styryl-4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate (compound number 18)



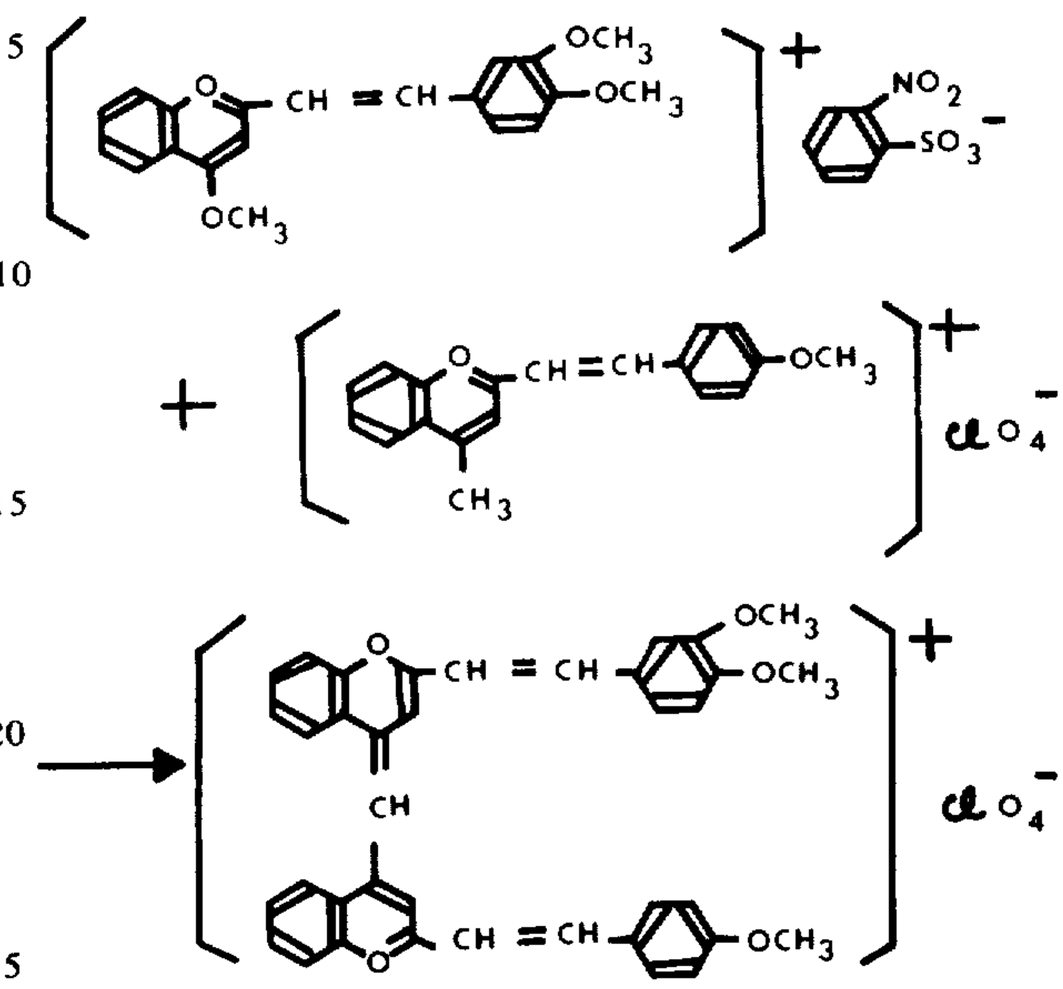
2-styryl-4-methoxybenzopyrylium o-nitrobenzenesulfon (melting point, 155° to 157° C) is obtained by a reaction of 2-styrylchromone and methyl o-nitrobenzenesulfonate in dry benzene at 50° C for 24 hours. According to the same reaction as shown in procedure a), 2-styryl-4-methoxybenzopyrylium o-nitrobenzenesulfonate reacts with 2-p-methoxystyryl-3-phenyl-4,6-dimethylbenzopyrylium perchlorate to obtain 2-p-methoxystyryl-3-phenyl-4-[(2'-styryl-4'-benzopyranylidene)methyl]-6-methylbenzopyrylium perchlorate crystals which have a color of reddish violet in dichloroethane and have a melting point of 159° to 162° C. The product is obtained in 73% yield.

(d) 2-(α-phenyl-p-methoxystyryl)-4-[(4'-benzopyranylidene)-methyl]benzopyrylium perchlorate (compound number 22)



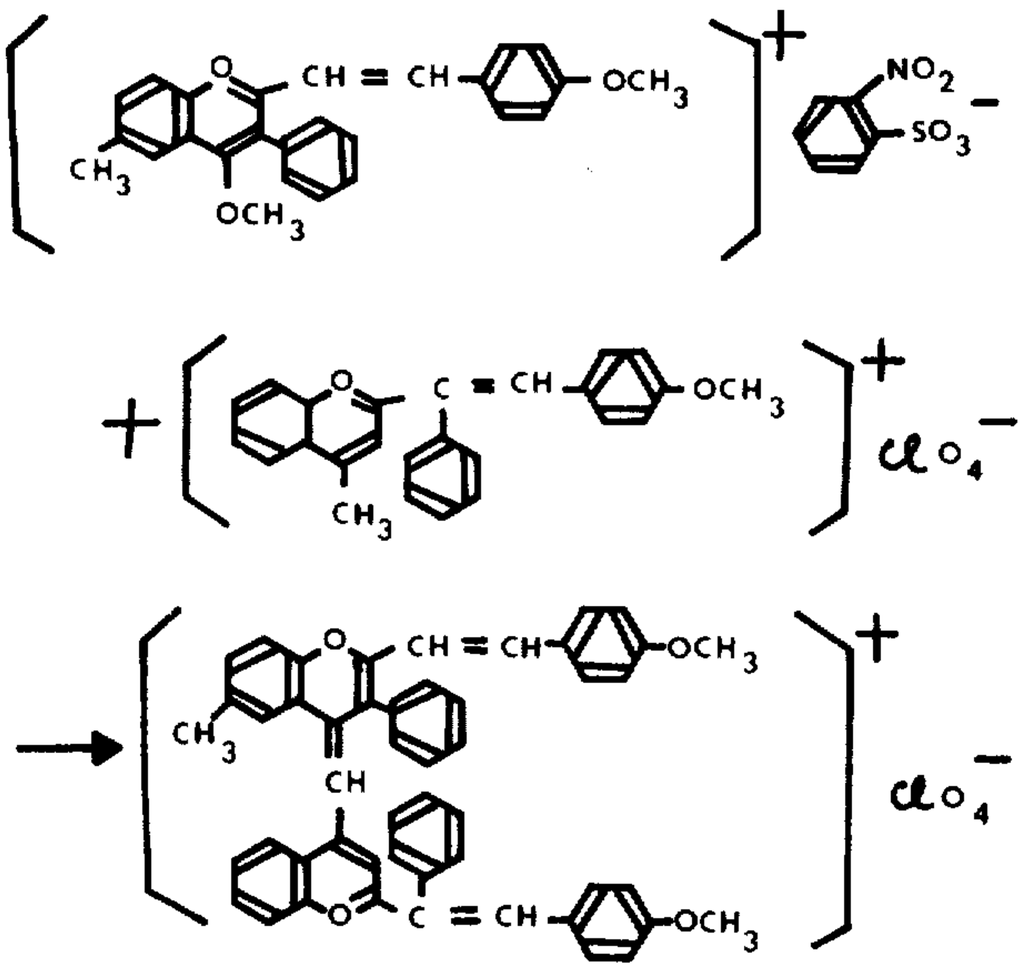
4-methoxybenzopyrylium o-nitrobenzenesulfonate reacts with 2-(α-phenyl-p-methoxystyryl)-4-methyl]-benzopyrylium perchlorate to 2-(α-phenyl-p-methoxystyryl)-4-[(4'-benzopyranylidene)methyl]-benzopyrylium perchlorate in the same procedure as the procedure (a). The crystals have a color of violet in dichloroethane and a melting point of 174° to 178°C. The product is obtained in 95% yield.

(e) 2-p-methoxystyryl-4-[(2'-3'',4''-dimethoxystyryl-4'-benzopyranylidene)methyl]benzopyrylium perchlorate (compound number 42)



2-(3',4'-Dimethoxystyryl)-4-methoxybenzopyrylium o-nitrobenzenesulfonate (melting point 211° to 213°C) is obtained from a reaction of 2-(3',4'-dimethoxystyryl)chromone and methyl o-nitrobenzene sulfonate. 6.5 Grams of 2-(3',4'-dimethoxystyryl)-4-methoxybenzopyrylium o-nitrobenzenesulfonate and 4,5 grams of 2-p-methoxystyryl-4-methylbenzopyrylium perchlorate are dissolved in 150 milliliters of acetic anhydride to a solution. The solution is heated at 100°C for 100 minutes. After cooling the solution is poured into 900 milliliters of 10 weight percent perchloric acid. Precipitates are filtered off and dried. For purification, reprecipitation is made using dichlorethane and ether. 3.2 Grams of product is obtained in 41% yield. The product has a color of drak violet in dichloroethane and a melting point of 175° to 181°C.

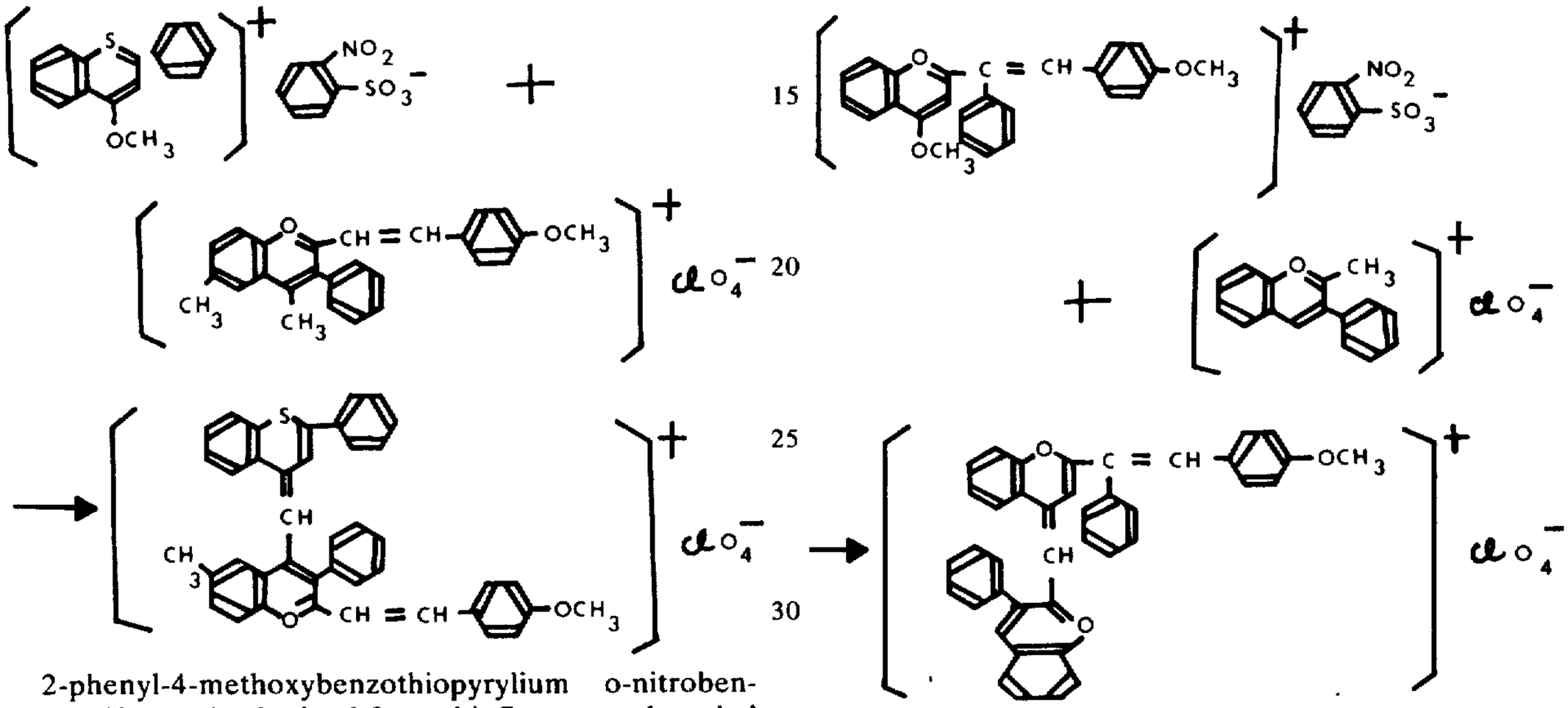
(f) 2-(α-phenyl-p-methoxystyryl)-4-(2'-p-methoxystyryl-3'-phenyl-6'-methyl-4'-benzopyranylidene)methyl]-benzopyrylium perchlorate (compound number 66)



2-p-Methoxystyryl-3-phenyl-4-methoxy-6-methylbenzopyrylium o-nitrobenzenesulfonate (melting point 141° to 144°C) is obtained from 2-p-methoxystyryl-3-

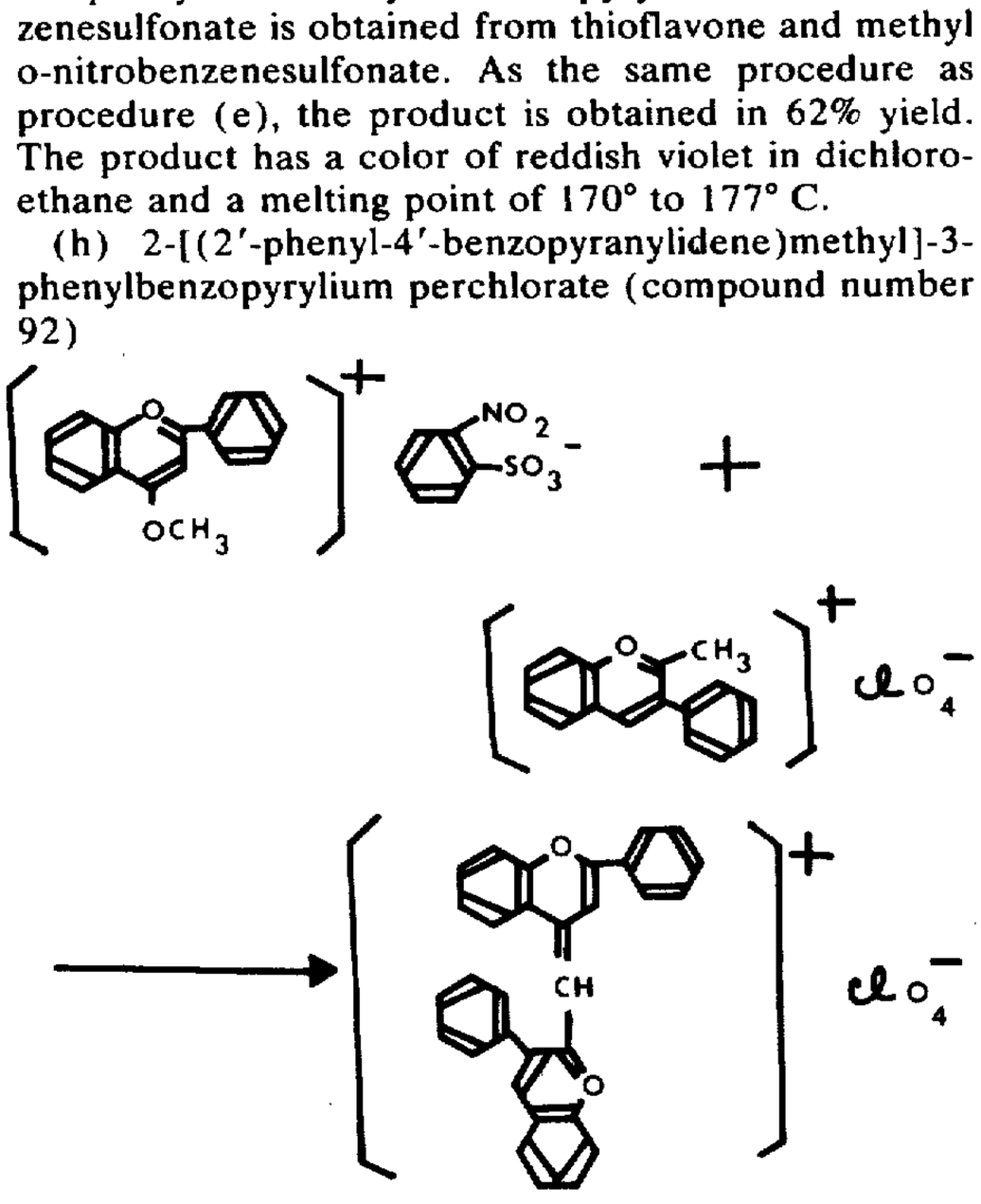
phenyl-6-methylchromone and methyl o-nitrobenzenesulfonate. 2-p-methoxystyryl-3-phenyl-4-methoxy-6-methylbenzopyrylium o-nitrobenzenesulfonate reacts with 2-(α-phenyl-p-methoxystyryl)-4-methylbenzopyrylium perchlorate in the same procedure as the procedure (e). The product has a color of violet in dichloroethane and a melting point of 190° to 193° C.

(g) 2-p-methoxystyryl-3-phenyl-4-[(2'-phenyl-4'-benzothiopyranylidene)methyl]-6-methyl]benzopyrylium perchlorate (compound number 85)



2-phenyl-4-methoxybenzothiopyrylium o-nitrobenzenesulfonate is obtained from thioflavone and methyl o-nitrobenzenesulfonate. As the same procedure as procedure (e), the product is obtained in 62% yield. The product has a color of reddish violet in dichloroethane and a melting point of 170° to 177° C.

(h) 2-[(2'-phenyl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate (compound number 92)



5.5 grams of 2-phenyl-4-methoxybenzopyrylium o-nitrobenzenesulfonate, which is obtained from flavone and methyl o-nitrobenzenesulfonate, and 4 grams of 2-methyl-3-phenylbenzopyrylium perchlorate are dissolved in 150 milliliters of acetic anhydride to a solution. The solution is heated at 100° C for 15 minutes. After cooling the solution is poured into 900 milliliters of 10 weight percent perchloric acid. Precipitated product is filtered off and dried. For purification, reprecipitation is made using dichloroethane and ether. The product has a color of blue in dichloroethane and a melting point of 128° to 134° C. The product yields 3 grams (theoretical yield 46%). Compound number 93 (fluoborate), compound number 94 (chloroferrate) or compound number 95 (nitrate) is obtained using either solution of borontrifluoride etherate, aqueous solution of ferric chloride or diluted nitric acid respectively instead of 10 weight percent perchloric acid.

(i) 2[(2'- 4 -phenyl-p-methoxystyryl-4'-benzopyranylidene)methyl]-3-phenylbenzopyrylium perchlorate (compound number 11)

2-(α-Phenyl-p-methoxystyryl)-4-methoxybenzopyrylium o-nitrobenzenesulfonate, which is obtained from 2-(α-phenyl-p-methoxystyryl)chromone and methyl o-nitrobenzenesulfonate, reacts with 2-methyl-3-phenylbenzopyrylium perchlorate in the same procedure as procedure (h). The reaction product yields in 43%. The product has a color of violet in dichloroethane and a melting point of 158° to 163°C.

It has been discovered according to the invention the compounds listed in Table 1 are sensitizing agents which can improve the photoconductivity and the spectrum characteristics of photoconductive polymeric compounds such as poly-N-vinylcarbazole, brominated poly-N-vinylcarbazoles, polyacenaphthylene, etc. These polymers, except brominated poly-N-vinylcarbazoles, are prepared in a per se well known method. The brominated poly-N-vinylcarbazole can be prepared by the following method: To the solution of 20 grams of poly-N-vinylcarbazole in 450 milliliters of chlorobenzene, there are added 18.44 grams of N-bromosuccinimide and 0.173 grams of benzoyl peroxide. The mixture is heated at 80°C for 2 hours while being stirred thoroughly and is poured into methanol to obtain a white polymer. The polymer is dissolved in chlorobenzene and again poured into methanol for purification. The pure polymer thus obtained as a precipitate exhibits upon elementary analysis a halogen content of 29.87 weight percent which approximates the value calculated, i.e. 29.44 weight percent of the monobromosubstituted product from poly-N-vinylcarbazole. This indicates that the polymer obtained is a monobromosubstituted product. The degree of bromination varies from 50 mole percent to 200 mole percent according to reaction conditions.

The novel sensitizer comprising at least one compound from the group listed in Table 1 is dissolved in a suitable solvent, such as dichloroethane, methylene chloride, chloroform, or a combination thereof, and is

dded to the solution of the photoconductive polymer escribed above. The preferable amount of the sensiizer added is from 0.01 to 3.0 weight parts in connecion with 100 weight parts of the photoconductive polyıer. Advantageously, the amount thereof is from 0.1 to .0 weight parts in connection with 100 weight parts of he photoconductive polymer.

For the preparation of the photoconductive insulatıg layer, a said solution of the photoconductive polyıer and the sensitizer in a suitable solvent is applied to he electroconductive support in per se usual manner, or example, by spraying, by means of bladed coating, y means of whirler coating, etc., and then dried so as o produce a homogeneous photoconductive insulating ayer on the electroconductive support. Operable solents are benzene, toluene, chlorobenzene, dioxane, ıethylene chloride, dichloroethane and combinations hereof. Said solution may be incorporated with suitble plasticizers and/or organic colloids for improving he flexibility and strength of the photoconductive polmer. Operable plasticizers are as follows: chlorinated liphenyl, dimethyl phthalate, diethyl phthalate and ıctyl phthalate. Operable organic colloids are as folows: natural and synthetic resins, e.g. phenol resin, ıhenol resin modified with resin, polyvinyl acetal, polyinyl butyral, polyvinyl cinnamate, polycarbonate esin. Operable materials for electroconductive supıorts may be made of any materials which satisfy the equirement of the electrophotographic art, e.g. metal late or glass plate having NESA coating, plate or foil ıade of electrically conductive resin or coated with vaporated thin metal layer. If paper is to be used as a upport for the photoconductive layer, pretreatment of he paper against penetration of the coating solution in dvisable. The transparent support can produce a ransparent electrophotographic plate, foil or film. ıfter an electrostatic charge has been applied, i.e. after ıe layer has been charged positively or negatively by ıeans of a corona discharge, the layer becomes light ensitive.

The reproduction of images by the electrophotoraphic method is carried out as follows: when the hotoconductive layer has been charged by means of a orona discharge apparatus, the support with the sensized layer is exposed to light under a master and is then usted over in a per se known manner with a resin owder colored with carbon black. The image that now ecomes visible can easily be wiped off. It can also be xed by heating at about 120°C. From positive masters, ositive images characterized by good contrast the roducted.

This invention is still further illustrated with refernce to the following illustrative examples.

EXAMPLE 1

1 Gram of polyacenaphthylene and 0.6 gram of, as a lasticiser, chlorinated diphenyl (commercially availble as "Kanechlor"), are dissolved in 8 milliliters of hlorobenzene. To the solution are added 0.5 milliliters f dichloroethane containing 0.006 gram of a sensitizer orresponding to compound number listed in Table 1. 'he solution is applied to an aluminum plate by means f whirler coating and is dried to form a layer of 7μ in hickness. After said aluminum plate provided with the ıyer is charged negatively by means of corona disharge with a charging device maintained at approxiıately 6000 volts in the dark, it is placed under a posiive master and is exposed to a 100W tungsten lamp at n illumination of 50 luxes, and the said plate is powered over with a developer in a per se known manner. This developer consists of toner and carrier. The toner consists of low melting point polystyrene, colophony and carbon black. The toner is mixed with a carrier substance such that the toner becomes triboelectrically charged with a charge opposite to that produced on the plate. A positive image is produced and is fixed by slight heating. In Table 2, there are shown the optimum amounts of exposure in lux-second units.

Table 2

Compound Number	Optimum Exposure (lux.sec)
none	200000
5	320
7	300
9	75
15	180
16	110
18	65
33	135
35	480
41	105
42	320
51	380
52	140
53	290
54	140
58	130
60	175
65	140
71	180
92	70
97	150
103	100
105	120
109	130
110	180
111	70
112	170
113	120
116	115

EXAMPLE 2

1 Gram of poly-N-vinylcarbazole, chlorinated diphenyl (commercially available as "Kanechlor") and 0.006 gram of a sensitizer, coresponding to compound number listed in Table 1, in 10 milliliters of dichloroethane to a solution. The solution is applied to an aluminum plate by means of blade coating and is dried to form a layer of 10μ in thickness. An electrophotographic image in the same way as that described in Example 1. In Table 3, there are shown the optimum amounts of exposure in lux-second units to produced exactly the original images.

Table 3

Compound Number	Optimum Exposure (lux.sec)
none	20000
1	50
2	220
3	60
4	70
5	22
6	44
7	26
8	62
9	44
10	48
11	160
12	220
13	90
14	75
15	28
16	36
17	115
18	22
23	180
26	110
27	44
28	36
29	40
30	60
32	120
33	36
34	50

Table 3-continued

Compound Number	Optimum Exposure (lux.sec)
35	30
36	46
37	90
41	52
42	44
43	48
45	75
47	58
48	34
49	35
50	70
51	30
53	26
54	28
56	28
57	20
58	24
59	36
60	44
61	44
62	100
64	54
65	44
66	22
67	74
70	56
71	20
72	22
76	60
78	38
80	46
82	50
83	24
84	19
85	17
86	54
87	42
88	25
89	28
90	30
91	140
92	18
93	20
34	23
95	40
96	66
29	24
98	230
99	460
100	50
101	36
102	115
103	36
104	68
105	19
106	120
107	58
108	76
109	46
110	36
111	20
112	42
113	48
114	54
115	54
116	52
117	64
118	50
119	135
120	90
121	30
122	28

It is clear from Table 3 that the novel sensitizers improve the photoconductivity of poly-N-vinylcarbazole.

EXAMPLE 3

1 Gram of brominated poly-N-vinylcarbazole (monobromo-substituted product), 0.5 gram of polycarbonate resin (commercially available as "Panlite-C"), 0.3 gram of chlorinated diphenyl (commercially available as "Kanechlor") and 0.002 gram of sensitizer listed in Table 1 are dissolved in a mixed-solvent of 8 milliliters of chlorobenzene and 2 milliliters of dichloroethane. This solution is applied to an aluminum plate by means of a blade coating and dried to form a layer of 14μ in

thickness. On this support, electrophotographic images are produced in the same way as that described in Example 1. Table 4 shows the optimum amounts of exposure in lux-second units to reproduce exactly the original images.

Table 4

Compound Number	Optimum Exposure (lux.sec)
none	80000
1	75
2	280
3	67
4	44
5	20
6	26
7	18
8	30
9	22
10	40
11	120
12	400
13	110
14	75
15	25
16	28
17	135
18	23
19	410
20	340
21	180
22	40
23	130
24	60
25	300
26	100
27	52
28	52
29	48
30	110
31	320
32	270
33	27
34	30
35	26
37	52
38	440
39	110
40	125
41	22
42	28
43	32
44	75
45	105
46	170
47	42
48	32
49	35
50	50
51	48
52	20
53	19
54	42
55	230
56	26
57	22
58	24
59	23
60	26
61	36
62	130
63	190
64	44
65	26
66	20
67	46
68	75
69	115
70	42
71	18
72	20
73	48
74	110
75	115
76	70
77	44
78	35
79	75
80	50
81	145
82	35
83	20
84	19
85	17
86	34
87	34

Table 4-continued

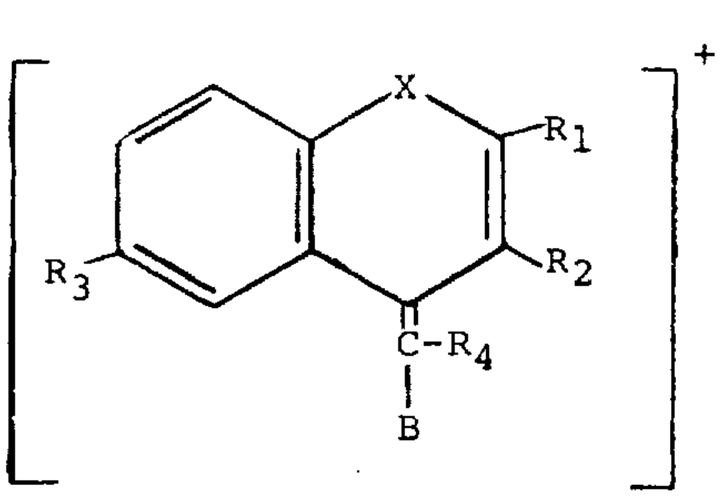
Compound Number	Optimum Exposure (lux.sec)
88	20
89	20
90	25
91	100
92	15
93	17
94	16
95	40
96	52
97	26
98	180
99	140
100	46
101	36
102	58
103	20
104	34
105	21
106	80
107	44
108	40
109	23
110	26
111	17
112	26
113	28
114	40
115	44
116	28
117	44
118	36
119	105
120	52
121	26
122	21
123	15
124	25
125	17
126	14
127	11
128	13

It is clear from Table 4 and FIGS. **1** to **9** that the ovel sensitizers improve the photoconductivity and ıe spectrum characteristics of brominated poly-N-inylcarbazole.

The invention has been described in detail with parcular reference to preferred embodiments thereof, ut it will be understood that variations and modificaons can be effected within the spirit and scope of the ıvention as described hereinabove and as defined in ıe appended claims.

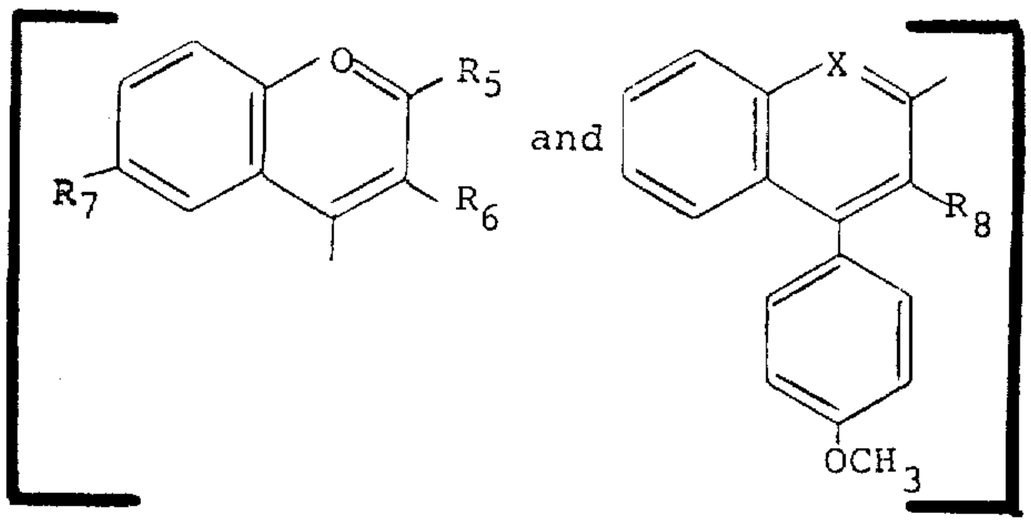
What we claim is:

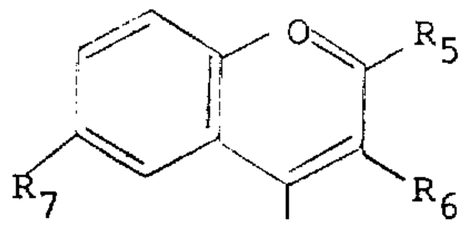
1. An electrophotographic material comprising a onductive support layer and photoconductive insulatıg layer, the latter comprising a combination of a hotoconductive polymeric compound and a sensitizıg amount of a sensitizer having the following formula:



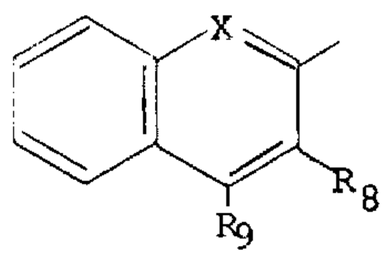
herein

B represents a radical selected from the group consting of

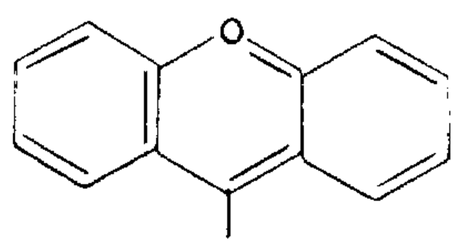




,



and



R_1 is hydrogen, phenyl or an ethenyl radical selected from the group consisting of styryl, p-methoxystyryl, 3,4-dimethoxy-styryl, α-phenylstyryl, α-phenyl-p-methoxystyryl, β-furyl(α′)ethenyl and α-phenyl-β-furyl(α′) ethenyl;

R_2 is hydrogen or phenyl;

R_3 is hydrogen, methyl or phenyl;

R_4 is hydrogen or phenyl;

R_5 is hydrogen, phenyl or an ethenyl radical selected from the group consisting of styryl, p-methoxystyryl, 3,4-dimethoxy-styryl, α-phenyl-p-methoxystyryl, β-furyl(α′)ethenyl and α-phenyl-β-furyl(α′)ethenyl;

R_6 is hydrogen or phenyl;

R_7 is hydrogen or phenyl;

R_8 is hydrogen or phenyl;

R_9 is hydrogen or p-methoxyphenyl;

the anion is an anionic function selected from the group consisting of perchlorate, fluoroborate, chloroferrate, chlorozincate and nitrate; and

X is oxygen or a sulfur atom;

said photoconductive polymeric compound comprising at least one compound selected from the group consisting of poly-N-vinylcarbazole, brominated poly-N-vinylcarbazole and polyacenaphthylene.

2. An electrophotographic material according to claim **1**, wherein said sensitizer comprises at least one compound selected from the group consisting of 2-(α-phenyl-p-methoxystyryl)-4-[(2′-phenyl-4′-benzopyranylidene)methyl]benzopyrylium perchlorate, 2-p-methoxystyryl-4-[(2′-3″,4″-dimethoxystyryl-3′-phenyl-6′-methyl-4′-benzopyranylidene)methyl]benzopyrylium perchlorate, 2-[(2′-phenyl-4′-benzopyranylidene) methyl]-3-phenyl benzopyrylium fluoroborate, 2-[(2′-phenyl-4′-benzopyranylidene)methyl]-4-p-methoxyphenyl benzothiopyrylium perchlorate, and 2-[(2′-phenyl-4′-benzothiopyryanylidene)-methyl]-4-p-methoxyphenyl benzothiopyrylium perchlorate.

3. An electrophotographic material according to claim **1**, wherein said combination comprises 100 weight parts of photoconductive polymeric compound and 0.01 to 3.0 weight parts of sensitizer.

* * * * *