alkyldimethylolphenol (R is alkyl)

This example demonstrates that the position of the three OH-groups relative to the phenyl ring is critical.

A polymer blend was prepared according to Method C from PANI(DBSA)0.5, alkyldimethylolphenol, and polyethylene. The measured electrical conductivity of the resulting blend was less than $10^{-9}$ S/cm.

## EXAMPLE 4

Example 3 was repeated; blends were prepared, according to method D, of PANI(DBSA)$_{0.5}$, polypropylene and a great variety of substituted aromatic compounds, all of which were determined to be solvents for the conductive polyaniline salt complex according to Method B. The values of the electrical conductivities of the blends are collected in Table 3.

### TABLE 3

Electrical conductivities of blends of PANI(DBSA)$_{0.5}$, polypropylene and various substituted aromatic compounds

| Compound | Conductivity, (S/cm) |
|---|---|
| 4-phenylphenol | $1.9 \times 10^{-3}$ |
| 2-phenylphenol | $1.9 \times 10^{-3}$ |
| hydroquinone benzyl ether | $6.3 \times 10^{-5}$ |
| benzyl 4-hydroxybenzoate | $1.3 \times 10^{-3}$ |
| bisphenol A | $1.3 \times 10^{-5}$ |
| dodecyl 4-hydroxybenzoate | $4.0 \times 10^{-4}$ |
| ethyl dihydroxybenzoate | $1.4 \times 10^{-3}$ |
| 3,3'-ethylenedioxydiphenol | $1.1 \times 10^{-4}$ |
| tert-butylhydroquinone | $3.5 \times 10^{-4}$ |
| tert-butylcatechol | $3.4 \times 10^{-4}$ |
| phenylhydroquinone | $3.8 \times 10^{-4}$ |
| p-cumylphenol | $3.8 \times 10^{-2}$ |
| 2,4-dihydroxybenzophenone | $1.4 \times 10^{-4}$ |
| dodecylresorcinol | $2.1 \times 10^{-2}$ |
| 2-hydroxydiphenylmethane | $9.0 \times 10^{-2}$ |
| 2,3,4-trihydroxybenzophenone | $5.6 \times 10^{-4}$ |
| ethyl gallate | $2.3 \times 10^{-2}$ |
| stearyl gallate | $3.4 \times 10^{-1}$ |

## EXAMPLE 5

Example 3 was repeated, but instead of 1.05 g, only 0.53 g of the substituted aromatic compound was used; blends were prepared, according to method D, of PANI(DBSA)$_{0.5}$, polypropylene and a variety a of gallates, all of which were determined to be solvents for the conductive polyaniline salt complex according to Method B. The values of the electrical conductivities of the blends are collected in Table 4.

### TABLE 4

Electrical conductivities of blends of PANI(DBSA)$_{0.5}$, polypropylene and various gallates*

| Compound | Conductivity, (S/cm) |
|---|---|
| ethyl gallate (EG) | $7.1 \times 10^{-3}$ |
| propyl gallate (PG) | $9.1 \times 10^{-3}$ |
| butyl gallate | $6.6 \times 10^{-2}$ |
| iso-amyl gallate | $3.6 \times 10^{-2}$ |
| octyl gallate | $2.1 \times 10^{-2}$ |
| dodecyl gallate | $1.6 \times 10^{-2}$ |
| cetyl gallate | $1.1 \times 10^{-2}$ |
| stearyl gallate (SG) | $7.4 \times 10^{-4}$ |

*a significantly smaller amount of gallates was employed.

## EXAMPLE 6

Example 3 was repeated, but instead of PANI(DBSA)$_{0.5}$, conductive polyaniline salt complexes were used that were protonated with CSA, TSA, according to Method A-2. HCl-protonated PANI was used directly as recovered from the polymerization in Method A-1. Blends were prepared, according to method D, of the salt complexes, polypropylene and various substituted aromatic compounds. The values of the electrical conductivities of the blends are collected in Table 5.

### TABLE 5

Electrical conductivities of blends of polypropylene, various substituted aromatic compounds, and polyaniline protonated with different acids.

| Protonic Acid | Subst. Arom. Compound | Conductivity, (S/cm) |
|---|---|---|
| CSA | EG | $2.2 \times 10^{-3}$ |
| CSA | PG | $1.0 \times 10^{-3}$ |
| CSA | SG | $2.3 \times 10^{-1}$ |
| CSA | HBBzE* | $3.0 \times 10^{-3}$ |
| TSA | SG | $5.3 \times 10^{-1}$ |
| TSA | EG | $1.0 \times 10^{-6}$ |
| TSA | dodecylresorcinol | $2.2 \times 10^{-3}$ |
| TSA | HBDE** | $4.0 \times 10^{-4}$ |
| HCl | SG | $<6 \times 10^{-11}$ |

*HBBzE: p-hydroxybenzoic acid benzyl ester
**HBDE: p-hydroxybenzoic acid dodecyl ester

In all of the above cases the substituted aromatic compounds were solvents for the conductive polyaniline salt complexes; except for the complex protonated with HCl. As is clear from the above table, the latter blend, accordingly, did not exhibit an improved conductivity.

## EXAMPLE 7

Blends were prepared according to the procedures of Method D [however, at 190° C., instead of 170° C. ] of nylon 12 (Polysciences), PANI(CSA)$_{0.5}$, and EG and SG, which both dissolve the conductive complex. The electrical conductivities were measured to be $1 \times 10^{-3}$ and $1 \times 10^{-11}$ for the compositions containing EG and SG, respectively. This example shows that the substituted aromatic compounds that dissolve conductive polyaniline salt complexes need to be compatible with the physico-chemical nature of the insulating matrix polymer. Here, the polar nylon 12 displays a dramatically enhanced conductivity with the gallate EG, which is relatively polar. By contrast, the very long alkyl tail of SG is nonpolar, and therefore is not optimal for blending with nylon 12, leading to a very low conductivity.

The inverse phenomenon, although somewhat less dramatic, is seen in some blends of Example 6. Here