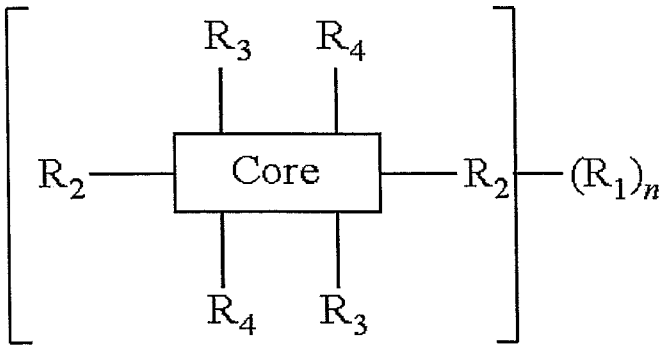

where Core is an aromatic polycyclic conjugated molecule,

R_1 is independently selected from the group consisting of unsubstituted or substituted C_1-C_{18}alkyl, unsubstituted or substituted C_2-C_{18}alkenyl, unsubstituted or substituted C_2-C_{18}alkynyl, and unsubstituted or substituted C_4-C_{18}aryl, fluorinated alkyl, chlorinated alkyl, branched and complex alkyl, branched and complex fluorinated alkyl, branched and complex chlorinated alkyl groups, and any combination thereof,

n is 1, 2, 3, 4, 5, 6, 7 or 8,

R_2 are substitutes located in apex positions,

R_3 and R_4 are substitutes located in side (lateral) positions, and

wherein the core has flat anisometric form and the R_2 substitutes are selected from hydrogen and electrophilic groups (acceptors) and R_3 substitutes and R_4 substitutes are independently selected from hydrogen and nucleophilic groups (donors) or vice versa R_3 substitutes and R_4 substitutes are independently selected from hydrogen and nucleophilic groups (donors),

wherein the substitutes R_2, R_3 and R_4 cannot all be hydrogen, and

wherein the aromatic polycyclic core is comprised of rylene fragments selected from the structures 1 to 21:

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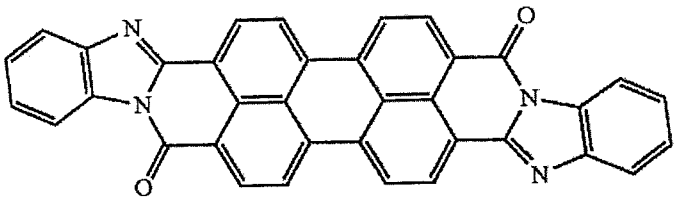

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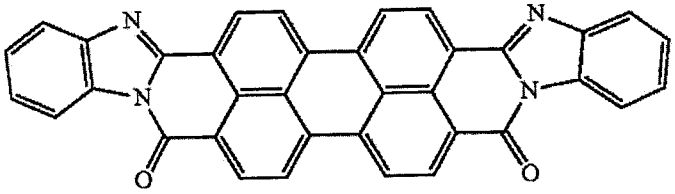

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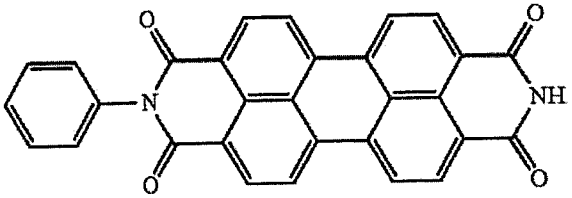

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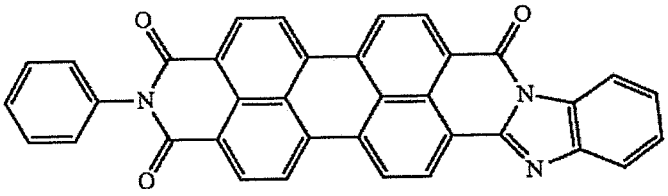

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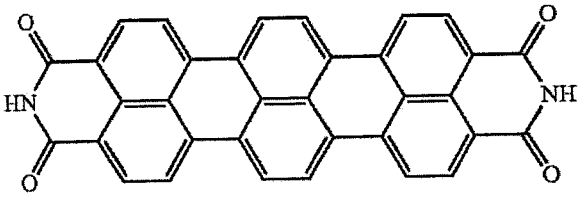

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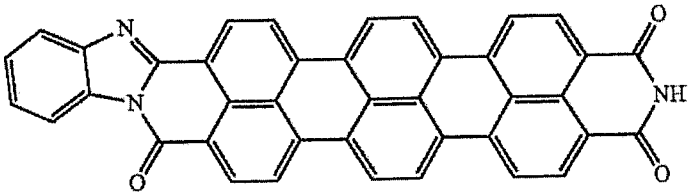

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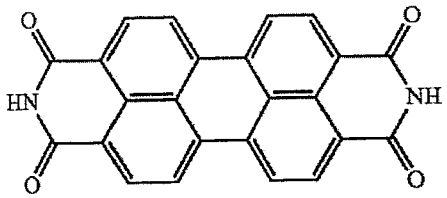

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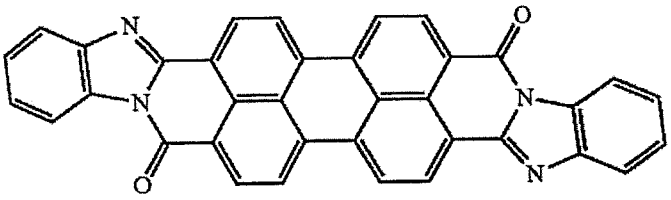

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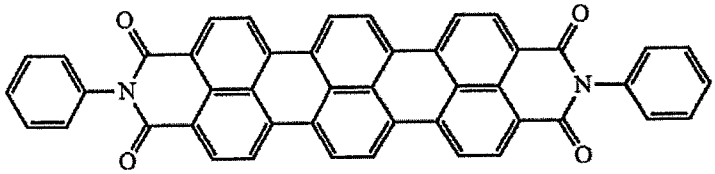

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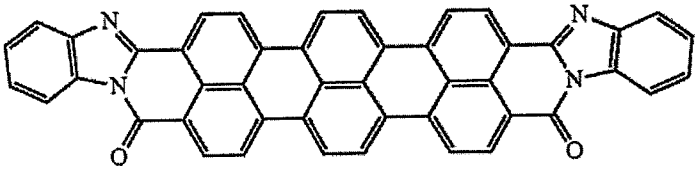

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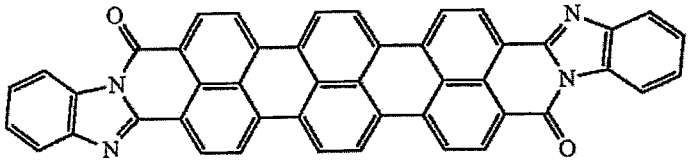

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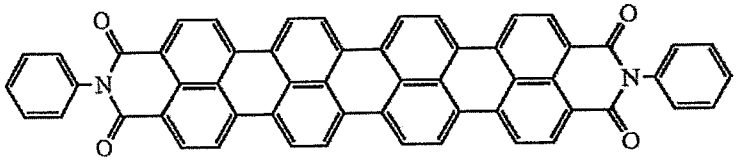

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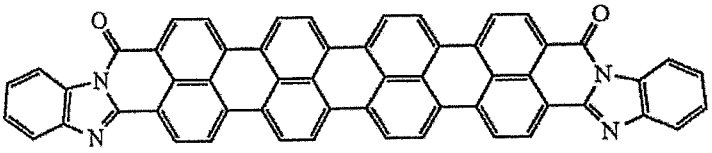

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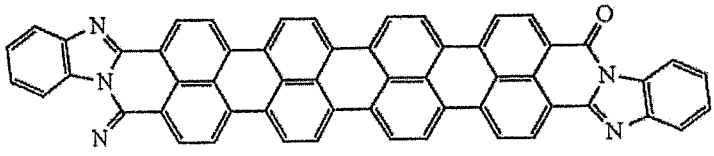

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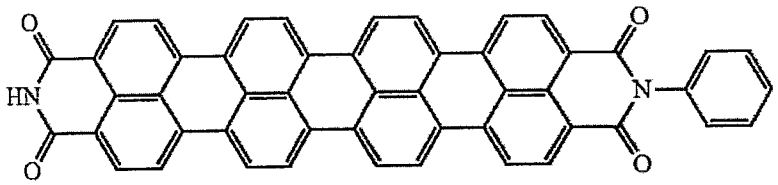

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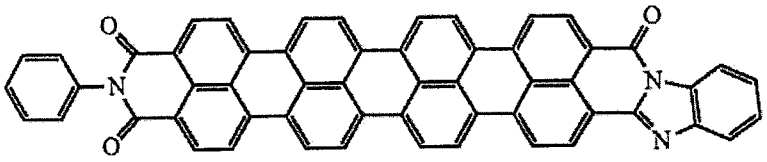

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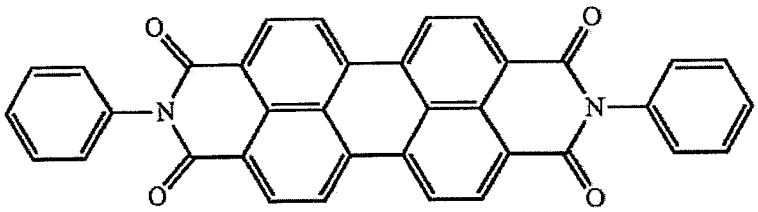

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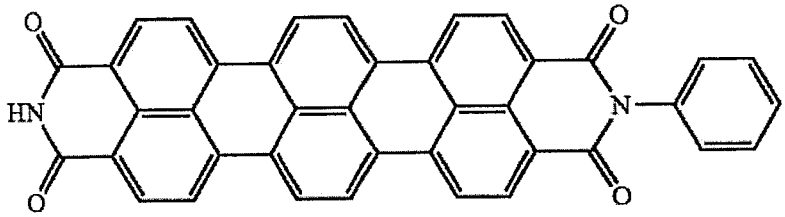

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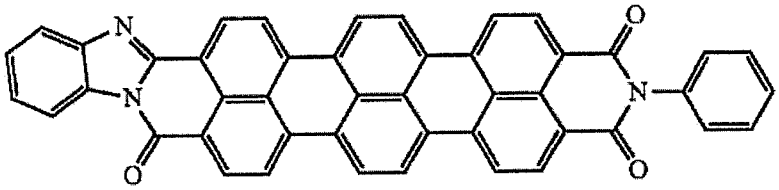

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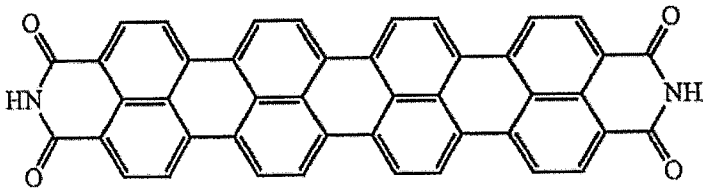

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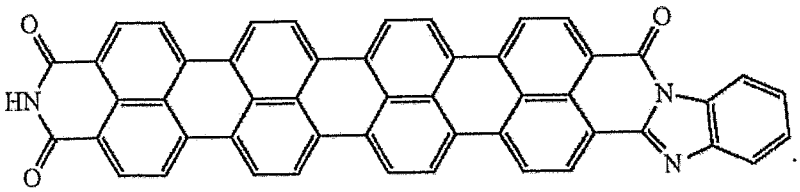


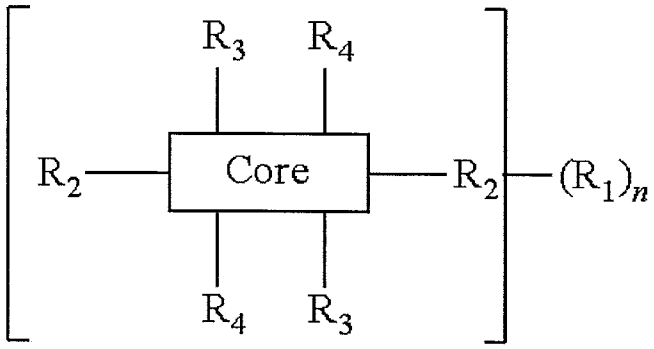
In another aspect, there is provided a crystal dielectric layer comprising the disclosed organic compound.

The present disclosure provides a capacitor comprising a first electrode, a second electrode, and a crystal dielectric layer disposed between said first and second electrodes, wherein said electrodes are flat and planar and positioned parallel to each other, and wherein said crystal dielectric layer comprises the disclosed organic compound. Said crystal dielectric layer comprises supramolecules formed with the aromatic polycyclic conjugated cores, and isotropic insulating sublayers formed with the substitutes served as the isolating groups. In another aspect, there is provided a capacitor comprising a first electrode, a second electrode, and a crystal dielectric layer disposed between said first and second electrodes, wherein said crystal dielectric layer comprises the organic compound disclosed herein, and wherein said crystal dielectric layer comprises supramolecules formed with the aromatic polycyclic conjugated cores, and isotropic insulating sublayers formed with the R_1 groups served as the isolating groups.

CLAIMS

What is claimed is:

1. An organic compound characterized by electronic polarizability and having a following general structural formula:



where Core is an aromatic polycyclic conjugated molecule,

R_1 is independently selected from the group consisting of unsubstituted or substituted C_1-C_{18}alkyl, unsubstituted or substituted C_2-C_{18}alkenyl, unsubstituted or substituted C_2-C_{18}alkynyl, and unsubstituted or substituted C_4-C_{18}aryl, fluorinated alkyl, chlorinated alkyl, branched and complex alkyl, branched and complex fluorinated alkyl, branched and complex chlorinated alkyl groups, and any combination thereof,

n is 1, 2, 3, 4, 5, 6, 7 or 8,

R_2 are substitutes located in apex positions,

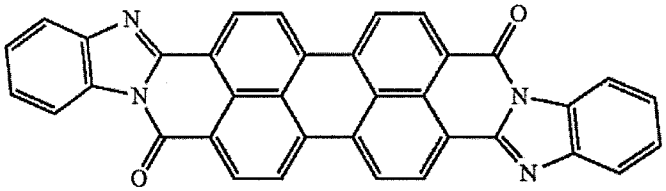
R_3 and R_4 are substitutes located in side (lateral) positions, and

wherein the core has flat anisometric form and the R_2 substitutes are selected from hydrogen and electrophilic groups (acceptors) and R_3 substitutes and R_4 substitutes are independently selected from hydrogen and nucleophilic groups (donors) or vice versa R_3 substitutes and R_4 substitutes are independently selected from hydrogen and nucleophilic groups (donors),

wherein the substitutes R_2, R_3 and R_4 cannot all be hydrogen, and

wherein the aromatic polycyclic core is comprised of rylene fragments selected from the structures 1 to 21:

1



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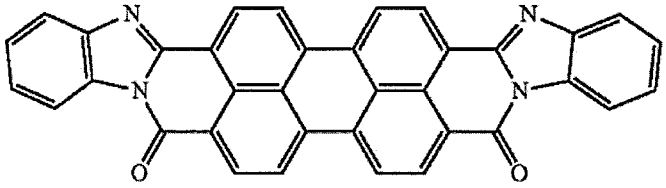

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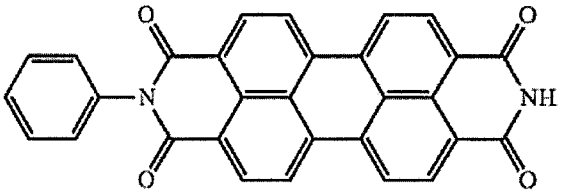

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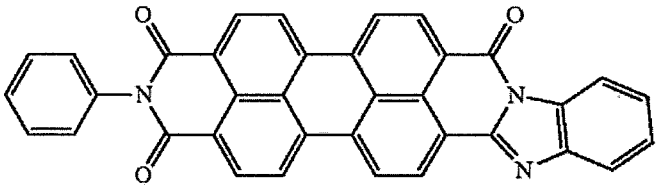

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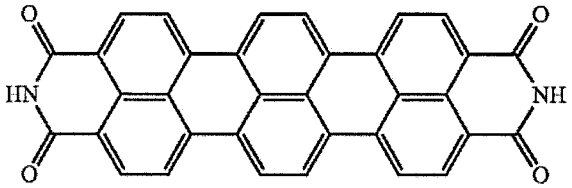

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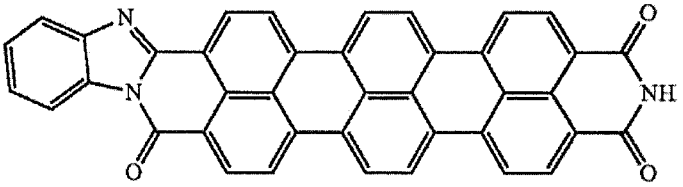

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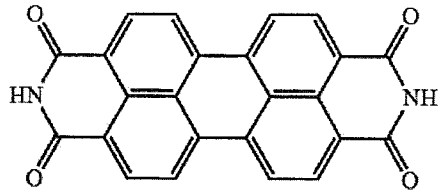

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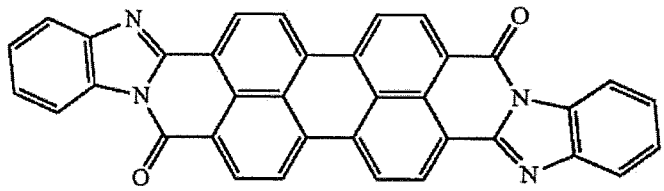

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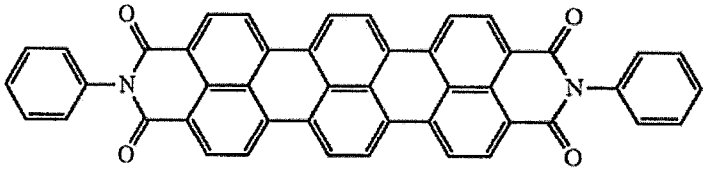

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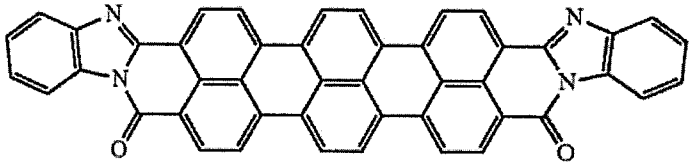

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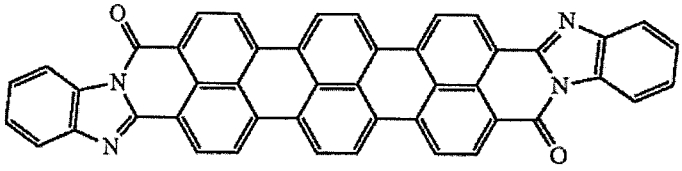

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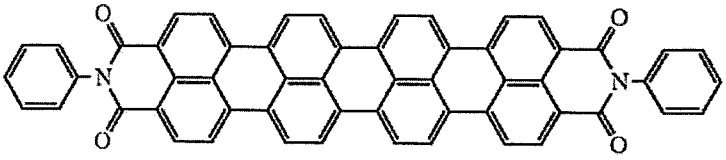

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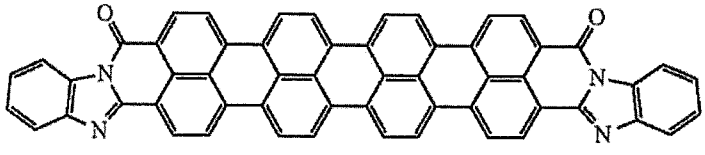

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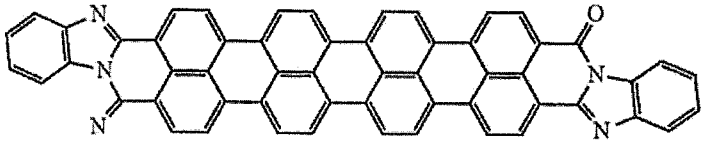

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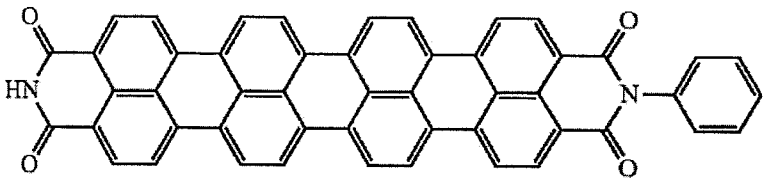

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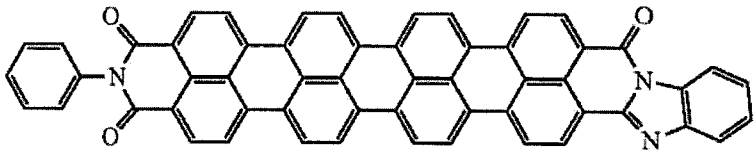

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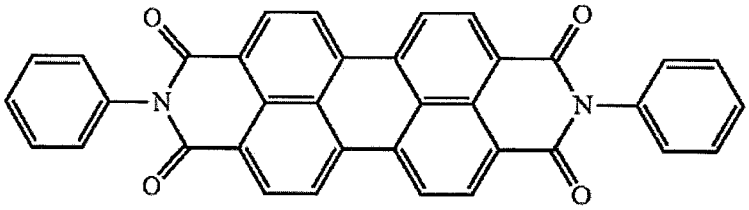

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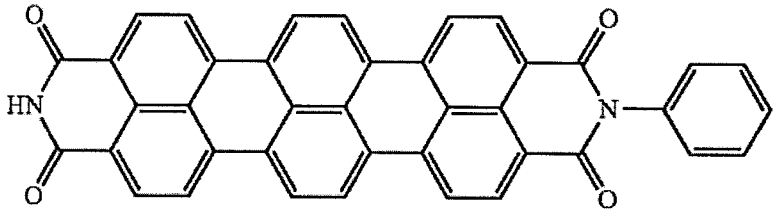

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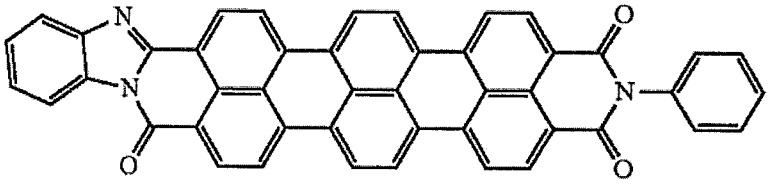

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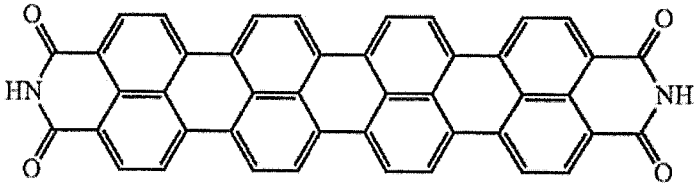

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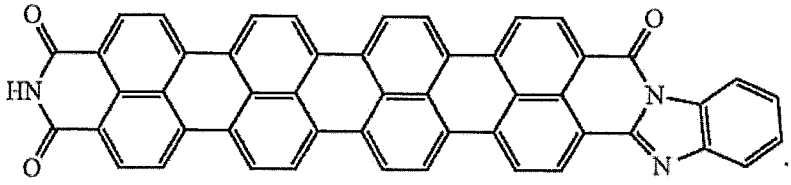

2. An organic compound according to claim 1, wherein said R_1 groups are isolating groups and are attached to the aromatic polycyclic conjugated core in apex positions and/or side position.

3. An organic compound according to claim 1, wherein the electrophilic groups (acceptors) are selected from —NO_2, —NH_3^+ and —NR_3^+ (quaternary nitrogen salts), —CHO (aldehyde), —CRO (keto group), —SO_3H (sulfonic acids), —SO_3R (sulfonates), SO_2NH_2 (sulfonamides), —COOH (carboxylic acid), —COOR (esters, from carboxylic acid side), —COCl (carboxylic acid chlorides), —$CONH_2$ (amides, from carboxylic acid side), —CF_3, —CCl_3, —CN, wherein R is radical selected from the list comprising alkyl (methyl, ethyl, isopropyl, tert-butyl, neopentyl, cyclohexyl etc.), allyl (—CH_2—CH=CH_2), benzyl (—$CH_2C_6H_5$) groups, and phenyl (+substituted phenyl).

4. An organic compound according to claim 1, wherein the nucleophilic groups (donors) are selected from —O^-(phenoxides, like —ONa or —OK), —NH_2, —NHR, NR_2, —OH, OR (ethers), —NHCOR (amides, from amine side), —OCOR (esters, from alcohol side), alkyls, —C_6H_5, vinyls, wherein R is radical selected from the list comprising alkyl (methyl, ethyl, isopropyl, tert-butyl, neopentyl, cyclohexyl etc.), allyl (—CH_2—CH=CH_2), benzyl (—$CH_2C_6H_5$) groups, and phenyl (+substituted phenyl).

5. An organic compound according to claim 1, wherein amino groups (—NH_2) are used as donors and nitro groups are used as acceptors.

6. A crystal dielectric layer comprising the organic compound according to any of claims 1-2, 3-4, 5.

7. A capacitor comprising a first electrode, a second electrode, and a crystal dielectric layer disposed between said first and second electrodes, wherein said crystal dielectric layer comprises the organic compound according to any of claims 1-2, 3-4, 5, and wherein said crystal dielectric layer comprises supramolecules formed with the aromatic polycyclic conjugated cores, and isotropic insulating sublayers formed with the R_1 groups served as the isolating groups.