Optoelectronic component

Claims

1. An optoelectronic component (1) comprising at least one photoactive layer (5) disposed between an electrode (3) and a counterelectrode (7), wherein the photoactive layer (5) comprises a mixed multiple layer containing at least three materials, wherein at least one material is an organic material composed of small molecules, wherein at least one material is a donor and at least one material is an acceptor, wherein the donor and the acceptor form a donor-acceptor system and at least one third material which is set up so as to affect the propensity of the donor and/or acceptor to crystallize **characterized in that** the third material comprises a crown ether.

2. The optoelectronic component as claimed in claim 1, **characterized in that** the third material has an energy level at which the magnitude of the LUMO <= the magnitude of the LUMO of the acceptor, and the magnitude of the HOMO >= HOMO of the donor.

3. The optoelectronic component as claimed in either of claims 1 and 2, **characterized in that** the third material has an energy level where the magnitude of the LUMO of the third material is 0.3 eV lower than the magnitude of the LUMO of the acceptor material of the photoactive layer (5) and/or the magnitude of the HOMO of the third material is 0.3 eV greater than the magnitude of the energy level of the HOMO of the donor material of the photoactive layer (5).

4. The optoelectronic component as claimed in any of the preceding claims, **characterized in that** the proportion of the third material in the photoactive layer (5) is 0.1% by weight < x < 30% by weight, preferably 0.1% by weight < x < 20% by weight, more preferably 0.1% by weight < x < 10% by weight.

5. The optoelectronic component as claimed in any of the preceding claims, **characterized in that** at least one donor material in the photoactive layer (5) is an oligomer.

6. The optoelectronic component as claimed in any of the preceding claims, **characterized in that** the third material is an oligomer.

7. The optoelectronic component as claimed in any of the preceding claims, **characterized in that** the third material is set up such that the third material, because of its molecular structure, minimizes crystallization of the donor and/or acceptor phase.

8. The optoelectronic component as claimed in any of the preceding claims, **characterized in that** crystallization of donor and/or acceptor is prevented.

9. The optoelectronic component as claimed in any of the preceding claims, **characterized in that** the molecular structure of the third material is set up such that the third material causes a lattice defect in the donor and/or acceptor material.

10. The optoelectronic component as claimed in any of the preceding claims, **characterized in that** the third material is selected such that the third material establishes a minimum separation between

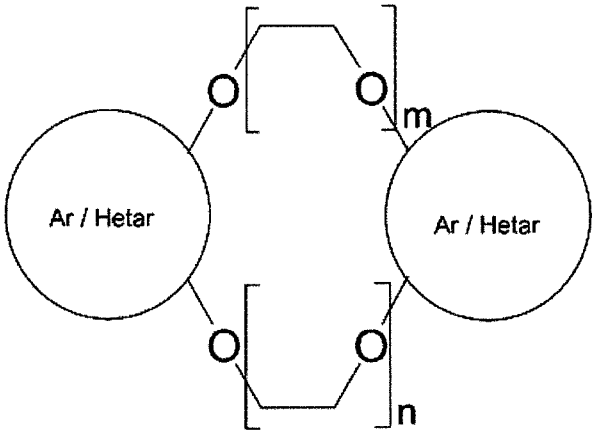
the acceptor and donor, wherein the third material simultaneously contributes to the phase separation of the acceptor and donor.

11. The optoelectronic component as claimed in any of the preceding claims, **characterized in that** the third material is set up such that the third material, because of its molecular structure, promotes crystallization of the donor and/or acceptor phase.

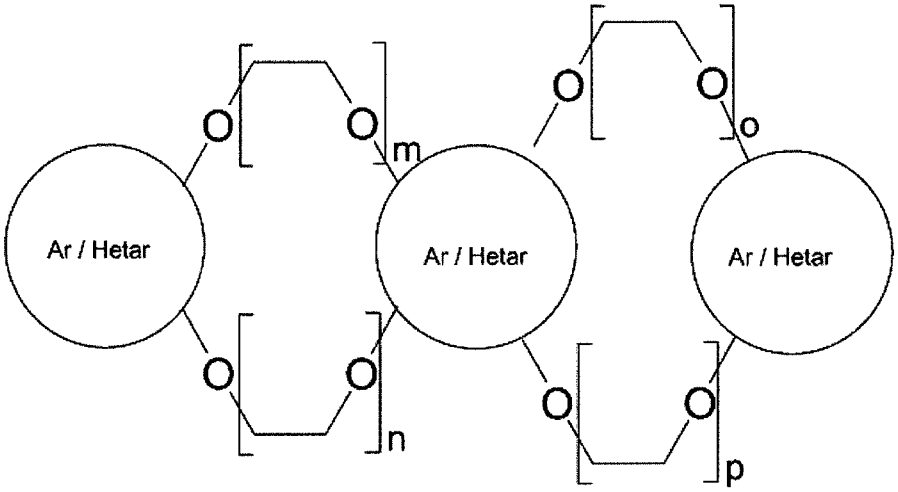
12. The optoelectronic component as claimed in any of the preceding claims, **characterized in that** the third material, in its molecular structure, has a first region set up to be fullerenophilic and a second region set up to be fullerenophobic, wherein the first and second regions are set up with spatial separation.

~~13. The optoelectronic component as claimed in any of the preceding claims, **characterized in that** the third material is selected from a group consisting of crown ethers, triphenyls, sorbitols, quinacridones, bis(4-(tert-butyl)benzoato-O)-hydroxyaluminum.~~

~~14~~13. The optoelectronic component as claimed in claim ~~13~~12, **characterized in that** the crown ethers are selected from a group of the general formula (Ia) or (Ib)



(Ia)



(Ib)

with Ar = phenyl, biphenyl, triphenyl, naphthyl, binaphthyl, 3-6 fused phenyl rings, anthracenyl, phenanthrenyl, pyrenyl

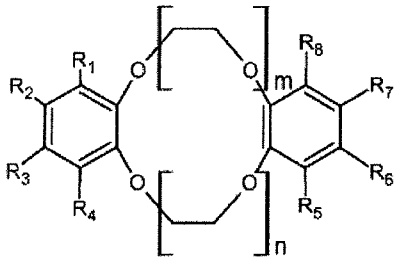
Hetar = thiophene, pyrrole, furan, oxazole, thiazole, oxadiazole, thiadiazole, triazole, pyridine, pyrimidine, pyrazine, benzothiophenes, benzopyrrole, benzofuran, benzothiophene, benzopyrrole, benzofuran, benzoxazole, benzothiazole, thienothiophenes, thienopyrrole, thienofuran, 3-6 fused heterocycles, dithienothiophene, dithienopyrrole, dithienobenzene, dithienocyclopentadienes, dipyrrolobenzene,

ether bridges joined in 1,2, 1,3 and 1,4 positions on the particular phenyl ring (ortho, meta and para positions), naphthyl ring, fused phenyl ring, and heteroaryl ring and fused heteroaryl ring,

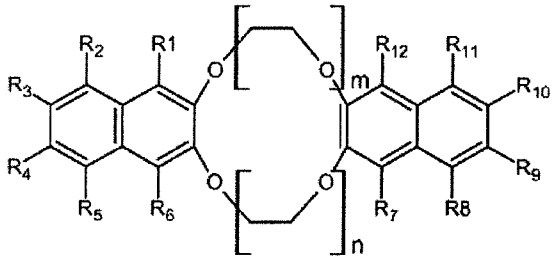
m and n are each independently 1, 2, 3, 4, 5, 6,

o and p are each independently 0, 1, 2, 3, 4, 5, 6.

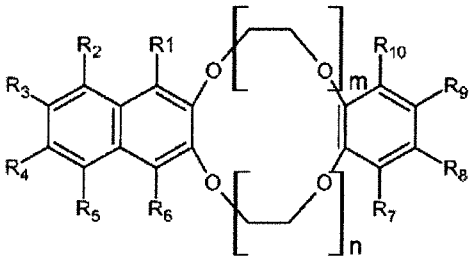
~~15~~14. The optoelectronic component as claimed in claim ~~14~~13, **characterized in that** the crown ethers are compounds of the following structures:



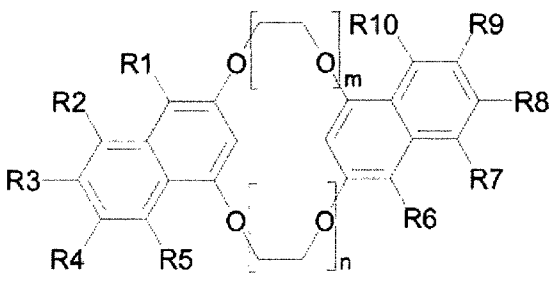
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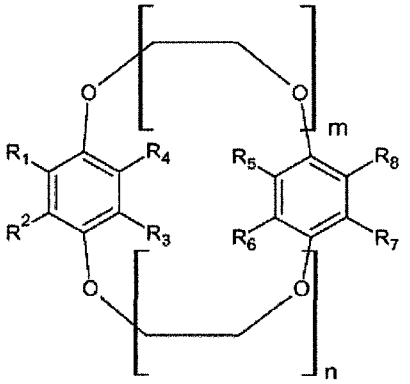


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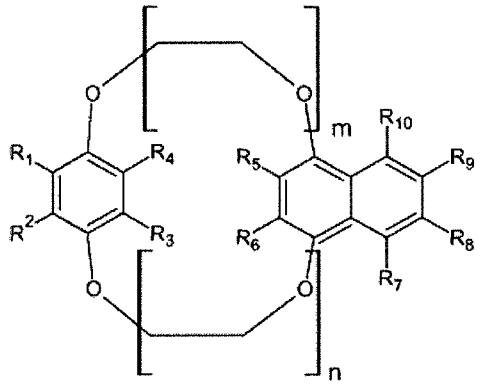


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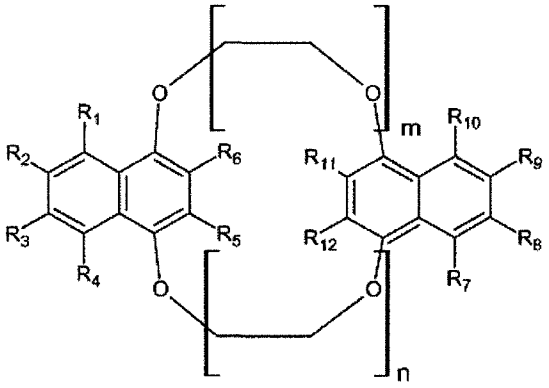




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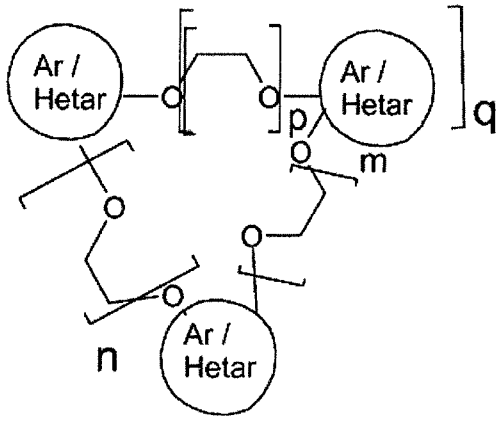
or



where in each case: n and m are each independently selected from 3, 4 and 5, and

R_1, R_2, R_3, R_4, R_5, R_6, R_7, R_8, R_9, R_{10}, R_{11} and R_{12} are each independently selected from H, CH_3, C_2H_5, C_3H_7, C_4H_9, C_5H_{11}, C_6H_{13}, isobutyl, CF_3, C_2F_5, C_3F_7, C_4F_9, C_5F_{11}, C_6F_{13}, OH, O-CH_3, CH_2-O-CH_3, CH_2-O-CH_2-CH_3, CN, phenyl, thiophene.

~~16~~15. The optoelectronic component as claimed in claim ~~13~~12, **characterized in that** the crown ethers have the following general formula (II):



(II)

with Ar = phenyl, biphenyl, triphenyl, naphthyl, binaphthyl, 3-6 fused phenyl rings (anthracenyl, phenanthrenyl, pyrenyl, …),

Hetar = thiophene, pyrrole, furan, oxazole, thiazole, oxadiazole, thiadiazole, triazole, pyridine, pyrimidine, pyrazine, benzothiophenes, benzopyrrole, benzofuran, benzothiophene, benzopyrrole, benzofuran, benzoxazole, benzothiazole, thienothiophenes, thienopyrrole, thienofuran, 3-6 fused heterocycles, dithienothiophene, dithienopyrrole, dithienobenzene, dithienocyclopentadienes, dipyrrolobenzene,

ether bridges joined in 1,2, 1,3 and 1,4 positions on the particular phenyl ring (ortho, meta and para positions), naphthyl ring, fused phenyl ring, and heteroaryl ring and fused heteroaryl ring,

m and n are each independently 1, 2, 3, 4, 5, 6,

p and q are each independently 1, 2, 3, 4, 5, 6.

~~17~~16. The optoelectronic component as claimed in any of the preceding claims, **characterized in that** the optoelectronic component (1) is an organic solar cell.

~~18~~17. The use of crown ethers as claimed in any of claims ~~14~~ 1 to ~~16~~ 15 in photoactive layers of optoelectronic components.