

Claims

- 5 1. A method of forming a light emitting diode array comprising a plurality of light emitting pixels, wherein at least one of the light emitting pixels comprises:
 a light emitting diode configured to emit light of a first primary peak wavelength; and
 organic semiconductors dispersed in a medium, wherein the organic
10 semiconductors are configured to receive and convert input light of the first primary peak wavelength from the light emitting diode to provide output light of a second primary peak wavelength.
- 15 2. The method according to claim 1, wherein at least one further light emitting pixel comprises:
 a further light emitting diode configured to emit light of the first primary peak wavelength; and
 further organic semiconductors dispersed in a further medium, wherein the
20 further organic semiconductors are configured to receive and convert input light of the first primary peak wavelength from the further light emitting diode to output light of a third primary peak wavelength.
- 25 3. The method according to claim 1 or 2, comprising depositing the medium and/or the further medium on a light emitting diode array, preferably wherein depositing the medium and/or further medium comprises slit coating or spin coating the medium and/or further medium.
- 30 4. The method according to claim 3, comprising selectively covering one or more light emitting diodes in the light emitting diode array with a material prior to depositing the medium and/or the further medium, thereby to enable selective deposition of the medium and/or further medium.
5. The method according to claim 4, wherein the material is at least one of:

a temporary material that is removable thereby to enable further deposition of the medium and/or the further medium on the selectively covered one or more light emitting diodes in a further distinct step after deposition of the medium and/or further medium on the light emitting diode array; and

an optically transparent material that enables light emission from the selectively covered one or more light emitting diodes, wherein the one or more light emitting diodes are configured to emit light with the primary peak wavelength.

6. The method according to any preceding claim, wherein the medium and/or further medium comprises at least one of: a resin, an epoxy and a polymer.
7. The method according to any preceding claim, comprising patterning an insulating layer on a light emitting diode array, thereby to define a perimeter of a light emitting surface of at least one light emitting pixel.
8. The method according to 7, comprising depositing a layer of insulating material on the light emitting diode array and selectively etching the insulating material to provide the patterned insulating layer.
9. The method according to claim 8, comprising depositing a conformal reflective layer on the patterned insulating layer and etching the conformal reflective layer thereby to provide a light emitting surface associated with the light emitting diode of the at least one of the plurality of light emitting pixels.
10. The method according to claim 9, comprising depositing the medium and/or the further medium on the light emitting diode array after etching the conformal reflective layer.
11. The method according to any preceding claim, comprising curing the medium and/or the further medium and planarising a surface of the light emitting diode array.

12. The method according to any preceding claim, comprising forming a passivation layer on the light emitting diode array, thereby to protect the medium and/or the further medium.
- 5 13. The method according to any preceding claim, wherein the organic semiconductors and/or the further organic semiconductors comprise conjugated organic semiconductors having a plurality of conjugated structures, preferably wherein the organic semiconductors and/or further organic semiconductors are formed from organic semiconductor material, more preferably wherein the plurality of conjugated
10 structures comprises a core and an arm, yet more preferably wherein at least two of the plurality of conjugated structures have a different functional property.
14. The method according to claim 13, wherein one functional property is absorption at the first primary peak wavelength and wherein one functional property is emission of
15 absorbed light at the second primary peak wavelength.
15. The method according to any preceding claim, wherein the light emitting diode array is a high resolution monolithic micro LED array, preferably wherein the method comprises forming a reflective layer between at least two of the light emitting diodes
20 in the high resolution monolithic micro LED array, more preferably wherein the high resolution monolithic LED has a pixel pitch less than 10 μm , preferably less than 4 μm .
16. The method according to any preceding claim, wherein the plurality of light emitting pixels each have a light emitting surface that is less than or equal to 100 μm^2 ,
25 preferably less than 16 μm^2 .
17. A light emitting diode array comprising a plurality of light emitting pixels, wherein at least one of the light emitting pixels comprises:
a light emitting diode configured to emit light of a first primary peak
30 wavelength; and organic semiconductors dispersed in a medium, wherein the organic semiconductors are

configured to receive and convert input light of the first primary peak wavelength from the light emitting diode to provide output light of a second primary peak wavelength.

18. The light emitting diode array according to claim 17, wherein at least one further light emitting pixel comprises:
- 5 a further light emitting diode configured to emit light of the first primary peak wavelength; and
- further organic semiconductors dispersed in a further medium, wherein the further organic semiconductors are configured to receive and convert input light of
- 10 the first primary peak wavelength from the further light emitting diode to output light of a third primary peak wavelength.
19. The light emitting diode array according to claim 17 or 18, wherein one or more of the light emitting diodes comprises a material covering a light emitting surface of the one
- 15 or more light emitting diodes, wherein the material is an optically transparent material that enables light emission from the covered one or more light emitting diodes, wherein the one or more light emitting diodes are configured to emit light with the primary peak wavelength.
20. The light emitting diode array according to any of claims 17 to 19, wherein the medium and/or further medium comprises at least one of: a resin, an epoxy and a polymer.
21. The light emitting diode array according to any of claims 17 to 20, comprising a patterned insulating layer on the light emitting diode array, thereby to define a
- 25 perimeter of a light emitting surface of at least one light emitting pixel, preferably comprising a conformal reflective layer on the patterned insulating layer.
22. The light emitting diode array according to any of claims 17 to 21, comprising a passivation layer on the light emitting diode array, thereby to protect the medium
- 30 and/or the further medium.

23. The light emitting diode array according to any of claims 17 to 22, wherein the organic semiconductors and/or the further organic semiconductors comprise conjugated organic semiconductors having a plurality of conjugated structures, preferably wherein the organic semiconductors and/or further organic semiconductors are formed from organic semiconductor material, more preferably wherein the plurality of conjugated structures comprises a core and an arm, yet more preferably wherein at least two of the plurality of conjugated structures have a different functional property, even more preferably wherein one functional property is absorption at the first primary peak wavelength and wherein one functional property is emission of absorbed light at the second primary peak wavelength.
24. The light emitting diode array according to any of claims 17 to 23, wherein the light emitting diode array is a high resolution monolithic micro LED array, preferably comprising forming a reflective layer between at least two of the light emitting diodes in the high resolution monolithic micro LED array, more preferably wherein the high resolution monolithic LED has a pixel pitch less than 10 μm , preferably less than 4 μm .
25. The light emitting diode array according to any of claims 17 to 24, wherein the plurality of light emitting pixels each have a light emitting surface that is less than or equal to 100 μm^2 , preferably less than 16 μm^2 .