~~What is claimed is:~~Claims

1. A light emitting structure array system with an off-axis micro-lens array structure comprising:

at least one light emitting mesa; and

at least one micro-lens, formed above the light emitting mesa, wherein a central axis of the at least one micro-lens is not coaxially aligned with a central axis of the at least one light emitting mesa.

2. The light emitting structure array system according to claim 1, wherein relative position of each micro-lens relative to a corresponding light emitting mesa in the light emitting structure array system are the same.

3. The light emitting structure array system according to~~ any one of claims 1-2~~ claim 1, further comprising a sensor, wherein emitting light rays from the at least one light emitting mesa through the at least one micro-lens are converted together into the sensor.

4. The light emitting structure array system according to claim 3, wherein the sensor is arranged at a central axis of the light emitting structure array system.

5. The light emitting structure array system according to claim 4, wherein a respective offset distance of a central axis of a respective micro-lens relative to a central axis of a respective light emitting mesa becomes larger from center of the light emitting structure array system to an edge of the light emitting structure array system.

6. The light emitting structure array system according to ~~any one of~~ claims 3~~-5~~, wherein the sensor is not arranged at a central axis of the light emitting structure array system.

7. The light emitting structure array system according to claim 6, wherein an offset distance of a central axis of a respective micro-lens relative to a central axis of a respective light emitting mesa becomes larger from a central axis of the sensor to an edge of the light emitting structure array system.

8. The light emitting structure array system according to ~~any one of~~ claims 6~~-7~~, wherein an angle of light emitted out of a respective micro-lens becomes larger from a central axis of the sensor to an edge of the light emitting structure array system.

9. The light emitting structure array system according to ~~any one of~~ claims 1~~-8~~, wherein an offset range of the central axis of the at least one micro-lens from the central axis of the at least one light emitting mesa is not more than 4.5 μm.

10. The light emitting structure array system according to ~~any one of~~ claims 1~~-9~~, wherein an offset distance between an edge of a bottom surface of the at least one light emitting mesa and an edge of a bottom surface of the at least one micro-lens is within 30% of a diameter of the bottom surface of the at least one micro-lens.

11. The light emitting structure array system according to ~~any one of~~ claims 1~~-10~~, wherein material of the at least one micro-lens is silicon oxide or organic materials.

12. The light emitting structure array system according to~~-any one of claims 1-11~~ claim 1, wherein a bottom surface of the at least one micro-lens intersects with the central axis of the at least one light emitting mesa.

13. The light emitting structure array system according to~~-any one of claims 1-12~~ claim 1, further comprising a semiconductor substrate and a reflective cup, wherein the at least one light emitting mesa is formed on the semiconductor substrate, and the at least one light emitting mesa is surrounded by the reflective cup.

14. The light emitting structure array system according to claim 13, wherein inside wall of the reflective cup is stair-shaped.

15. The light emitting structure array system according to~~-any one of claims 13-14~~ claim 13, wherein the at least one light emitting mesa includes:

a light emitting layer,

a bottom bonding layer, at a bottom of the light emitting layer and bonded with the semiconductor substrate, and

a top electrode layer, covering the at least one light emitting mesa and electrically connected with the reflective cup, wherein the reflective cup is electrically connected with the semiconductor substrate.

16. The light emitting structure array system according to ~~any one of~~ claims 1~~-15~~, further comprising a spacer, formed between the at least one light emitting mesa and the at

least one micro-lens.

17. The light emitting structure array system according to claim 16, wherein height of the spacer is less than height of the at least one micro-lens.

18. The light emitting structure array system according to ~~any one of claims 13-17~~ claim 13, wherein the semiconductor substrate is an IC substrate.

19. The light emitting structure array system according to claim 13, wherein inside wall of the reflective cup comprises multiple sidewalls at different angles.

~~19.~~20. A light emitting structure array system with ~~at least one~~ an off-axis micro-lens~~,~~ array structure comprising:

~~a~~ two or more light emitting mesas; and

~~a first~~ two or more micro-lenses, each of the two or more micro-lenses formed ~~on~~ above each of the two or more light emitting mesas; ~~and,~~

~~a second micro-lens, formed on the light emitting mesa and covering the first micro-lens~~wherein a respective offset distance of a central axis of a respective micro-lens relative to a central axis of a respective light emitting mesa becomes larger from center of the light emitting structure array system to an edge of the light emitting structure array system.

~~20. The light emitting structure with at least one off-axis micro-lens according to claim 19, wherein diameter of the second micro-lens is larger than diameter of the first micro-lens.~~

~~21. The light emitting structure with at least one off-axis micro-lens according to any one of claims 19-20, wherein a central axis of the first micro-lens is coaxially aligned with a central axis of the light emitting mesa, and a central axis of the second micro-lens is not coaxially aligned with the central axis of the light emitting mesa.~~

~~22. The light emitting structure with at least one off-axis micro-lens according to any one of claims 19-21, wherein a central axis of the second micro-lens is coaxially aligned with a central axis of the light emitting mesa, and a central axis of the first micro-lens is not coaxially aligned with the central axis of the light emitting mesa.~~

~~23. The light emitting structure with at least one off-axis micro-lens according to~~

~~any one of claims 19-22, wherein a central axis of the first micro-lens is not coaxially aligned with a central axis of the light emitting mesa, a central axis of the second micro-lens is not coaxially aligned with the central axis of the light emitting mesa, and, the central axis of the first micro-lens is not coaxially aligned with the central axis of the second micro-lens.~~

~~24. The light emitting structure with at least one off-axis micro-lens according to any one of claims 19-23, wherein the light emitting structure includes more than one set of light emitting mesa, first micro-lens and second micro-lens, and a position of a respective first micro-lens relative to a respective second micro-lens on the light emitting structure within a respective set is different.~~

~~25. The light emitting structure with at least one off-axis micro-lens according to any one of claims 21-24, wherein an offset distance between the central axis of the second micro-lens and the central axis of the light emitting mesa is not more than 12 μm.~~

~~26. The light emitting structure with at least one off-axis micro-lens according to any one of claims 22-25, wherein an offset distance between the central axis of the first micro-lens and the central axis of the light emitting mesa is not more than 1.5 μm.~~

~~27. The light emitting structure with at least one off-axis micro-lens according to any one of claims 23-26, wherein an offset distance between the central axis of the first micro-lens and the central axis of the second micro-lens is not more than 6 μm and is not less than 4.5 μm.~~

~~28. The light emitting structure with at least one off-axis micro-lens according to any one of claims 19-27, wherein a bottom surface of the second micro-lens intersects with a central axis of the light emitting mesa.~~

~~29. The light emitting structure with at least one off-axis micro-lens according to claim 28, wherein a bottom surface of the first micro-lens intersects with the central axis of the light emitting mesa.~~

~~30. The light emitting structure with at least one off-axis micro-lens according to any one of claims 28-29, wherein material of the first micro-lens is as same as material of the second micro-lens.~~

31. The light-emitting structure with at least one off-axis micro-lens according to any one of claims 19-30, further comprising a semiconductor substrate and a reflective cup, wherein the light emitting mesa is formed on the semiconductor substrate, and the light emitting mesa is surrounded by the reflective cup.

32. The light-emitting structure with at least one off-axis micro-lens according to claim 31, wherein inside wall of the reflective cup is stair-shaped.

33. The light-emitting structure with at least one off-axis micro-lens according to any one of claims 31-32, wherein the light emitting mesa includes:

a light emitting layer,

a bottom bonding layer, at a bottom of the light emitting layer and bonded with the semiconductor substrate, and

a top electrode layer, covering the light emitting mesa and electrically connected with the reflective cup, wherein the reflective cup is electrically connected with the semiconductor substrate.

34. The light-emitting structure with at least one off-axis micro-lens according to any one of claims 19-33, further comprising a spacer, formed between the light emitting mesa and the first micro-lens.

35. The light-emitting structure with at least one off-axis micro-lens according to claim 34, wherein a height of the spacer is less than that of the first micro-lens.

36. The light-emitting structure with at least one off-axis micro-lens according to any one of claims 31-35, wherein the semiconductor substrate is an IC substrate.

37. A light emitting structure with at least one off-axis micro-lens, comprising:

a light emitting mesa;

a first micro-lens, formed on the light emitting mesa; and,

a second micro-lens, formed on the first micro-lens.

38. The light-emitting structure with at least one off-axis micro-lens according to claim 37, wherein diameter of the second micro-lens is less than diameter of the first micro-lens.

~~39. The light-emitting structure with at least one off-axis micro-lens according to any one of claims 37-38, wherein a central axis of the first micro-lens is coaxially aligned with a central axis of the light-emitting mesa, and a central axis of the second micro-lens is not coaxially aligned with the central axis of the light-emitting mesa.~~

~~40. The light-emitting structure with at least one off-axis micro-lens according to any one of claims 37-39, wherein the light-emitting structure includes more than one set of light-emitting mesa, first micro-lens and second micro-lens, and a position of a respective first micro-lens relative to a respective second micro-lens on the light-emitting structure within a respective set is different.~~

~~41. The light-emitting structure with at least one off-axis micro-lens according to any one of claims 39-40, wherein an offset distance between the central axis of the second micro-lens and the central axis of the light-emitting mesa is not more than 1.5 μm.~~

~~42. The light-emitting structure with at least one off-axis micro-lens according to any one of claims 37-41, wherein a bottom surface of the first micro-lens intersects with a central axis of the light-emitting mesa.~~

~~43. The light-emitting structure with at least one off-axis micro-lens according to claim 42, wherein a bottom surface of the second micro-lens does not intersect with the central axis of the light-emitting mesa.~~

~~44. The light-emitting structure with at least one off-axis micro-lens according to any one of claims 37-43, wherein material of the first micro-lens is the same as material of the second micro-lens.~~

~~45. The light-emitting structure with at least one off-axis micro-lens according to any one of claims 37-44, further comprising a semiconductor substrate and a reflective cup, wherein the light-emitting mesa is formed on the semiconductor substrate, and the light-emitting mesa is surrounded by the reflective cup.~~

~~46. The light-emitting structure with at least one off-axis micro-lens according to claim 45, wherein inside wall of the reflective cup is stair-shaped.~~

~~47. The light-emitting structure with at least one off-axis micro-lens according to~~

any one of claims 45-46, wherein the light emitting mesa includes:

a light emitting layer,

a bottom bonding layer, at a bottom of the light emitting layer and bonded with the semiconductor substrate, and

a top electrode layer, covering the light emitting mesa and electrically connected with the reflective cup, wherein the reflective cup is electrically connected with the semiconductor substrate.

48. The light emitting structure with at least one off-axis micro-lens according to any one of claims 37-47, further comprising a spacer, formed between the light emitting mesa and the first micro-lens.

49. The light emitting structure with at least one off-axis micro-lens according to claim 48, wherein height of the spacer is less than height of the first micro-lens.

50. The light emitting structure with at least one off-axis micro-lens according to any one of claims 45-49, wherein the semiconductor substrate is an IC substrate.

51. A light emitting structure with an off-axis micro-lens structure, comprising:

a first light emitting mesa;

at least a first micro-lens, formed above the first light emitting mesa, wherein a central axis of the first micro-lens is not coaxially aligned with a central axis of the first light emitting mesa;

a second light emitting mesa;

at least a second micro-lens, formed above the second light emitting mesa; and

at least a third micro-lens, formed on the second light emitting mesa.

52. The light emitting structure according to claim 51, wherein the third micro-lens covers and contacts a whole top surface of the second micro-lens.

53. The light emitting structure according to any one of claims 51-52, wherein an offset range of the central axis of the first micro-lens from the central axis of the first light emitting mesa is not more than 4.5 μm.

54. The light emitting structure according to any one of claims 51-53, wherein an offset distance between an edge of a bottom surface of the first light emitting mesa and an edge

~~of a bottom surface of the first micro-lens is within 30% of a diameter of the bottom surface of the first micro-lens.~~

~~55. The light emitting structure according to any one of claims 51-54, wherein material of the first micro-lens is silicon oxide or organic materials.~~

~~56. The light emitting structure according to any one of claims 51-55, wherein a bottom surface of the first micro-lens intersects with the central axis of the first light emitting mesa.~~

~~57. The light emitting structure according to any one of claims 51-56, further comprising a semiconductor substrate and at least two reflective cups, wherein the first light emitting mesa, the second light emitting mesa are formed on the semiconductor substrate, and the first light emitting mesa and the second light emitting mesa are surrounded by a respective reflective cup of the two reflective cups.~~

~~58. The light emitting structure according to claim 57, wherein inside walls of the reflective cups are stair-shaped.~~

~~59. The light emitting structure according to any one of claims 57-58, wherein the first light emitting mesa includes:~~

~~a first light emitting layer,~~

~~a first bottom bonding layer, at a bottom of the first light emitting layer and bonded with the semiconductor substrate, and~~

~~a top electrode layer, at a top surface the first light emitting mesa and electrically connected with a first reflective cup of the two reflective cups; and,~~

~~wherein the second light emitting mesa includes:~~

~~a second light emitting layer,~~

~~a second bottom bonding layer, at a bottom of the second light emitting layer and bonded with the semiconductor substrate, and~~

~~the top electrode layer, also at a top surface of the second light emitting mesa and electrically connected with a second reflective cup of the two reflective cups, wherein the first and the second reflective cups are electrically connected with the semiconductor substrate.~~

~~60. The light emitting structure according to any one of claims 51-59, further comprising a spacer, covering the first light emitting mesa and the second light emitting mesa, wherein the spacer is formed between the first light emitting mesa and the first micro-lens, and the spacer is also formed between the second light emitting mesa and the second micro-lens.~~

~~61. The light emitting structure according to claim 60, wherein height of the spacer is less than height of the first micro-lens.~~

~~62. The light emitting structure according to any one of claims 51-61, wherein diameter of the third micro-lens is larger than diameter of the second micro-lens.~~

~~63. The light emitting structure according to any one of claims 51-62, wherein a central axis of the second micro-lens is coaxially aligned with a central axis of the second light emitting mesa, and a central axis of the third micro-lens is not coaxially aligned with the central axis of the second light emitting mesa.~~

~~64. The light emitting structure according to any one of claims 51-63, wherein a central axis of the third micro-lens is coaxially aligned with a central axis of the second light emitting mesa, and a central axis of the second micro-lens is not coaxially aligned with the central axis of the second light emitting mesa.~~

~~65. The light emitting structure according to any one of claims 51-64, wherein a central axis of the second micro-lens is not coaxially aligned with a central axis of the second light emitting mesa, a central axis of the third micro-lens is not coaxially aligned with the central axis of the second light emitting mesa, and, the central axis of the second micro-lens is not coaxially aligned with the central axis of the third micro-lens.~~

~~66. The light emitting structure according to any one of claims 51-65, wherein the light emitting structure includes more than one set of light emitting mesa, first micro-lens, second micro-lens, and third micro-lens, and a position of a respective second micro-lens relative to a respective third micro-lens on the light emitting structure within a respective set is different.~~

~~67. The light emitting structure according to any one of claims 63-66, wherein an offset distance between the central axis of the third micro-lens and the central axis of the second~~

~~light emitting mesa is not more than 12 μm.~~

~~68. The light emitting structure according to claim 67, wherein an offset distance between the central axis of the second micro-lens and the central axis of the second light emitting mesa is not more than 1.5 μm.~~

~~69. The light emitting structure according to claim 68, wherein an offset distance between the central axis of the second micro-lens and the central axis of the third micro-lens is not more than 6 μm and is not less than 4.5 μm.~~

~~70. The light emitting structure according to any one of claims 51-69, wherein a bottom surface of the third micro-lens intersects with a central axis of the second light emitting mesa.~~

~~71. The light emitting structure according to claim 70, wherein a bottom surface of the second micro-lens does not intersect with a central axis of the second light emitting mesa.~~

~~72. The light emitting structure according to any one of claims 70-71, wherein material of the second micro-lens is the same as material of the third micro-lens, and, material of the first micro-lens is the same as material of the third micro-lens.~~

~~73. The light emitting structure according to any one of claims 51-72, wherein an offset distance between the central axis of the first micro-lens and the central axis of the first light emitting mesa is less than an offset distance between a central axis of the third micro-lens and a central axis of the second light emitting mesa.~~

~~74. The light emitting structure according to any one of claims 57-73, wherein the semiconductor substrate is an IC substrate.~~

~~75. A light emitting structure, comprising:~~

~~a first light emitting mesa;~~

~~a first micro-lens, formed above the first light emitting mesa, wherein a central axis of the first micro-lens is not coaxially aligned with a central axis of the first light emitting mesa;~~

~~a second light emitting mesa;~~

~~a second micro-lens, formed above the second light emitting mesa; and~~

a third micro-lens, formed on the second micro-lens, wherein the third micro-lens does not cover a whole top surface of the second micro-lens.

76. The light-emitting structure according to claim 75, wherein an offset distance between the central axis of the first micro-lens and the central axis of the first light-emitting mesa is not more than 4.5 μm.

77. The light-emitting structure according to any one of claims 75-76, wherein an offset distance between an edge of a bottom surface of the first light-emitting mesa and an edge of a bottom surface of the first micro-lens is within 30% of a diameter of the bottom surface of the first micro-lens.

78. The light-emitting structure according to any one of claims 75-77, wherein material of the first micro-lens is silicon oxide or organic materials.

79. The light-emitting structure according to any one of claims 75-78, wherein a bottom surface of the first micro-lens intersects with the central axis of the first light-emitting mesa.

80. The light-emitting structure according to any one of claims 75-79, further comprising a semiconductor substrate and reflective cups, wherein the first light-emitting mesa and the second light-emitting mesa are formed on the semiconductor substrate, and wherein the first light-emitting mesa and the second light-emitting mesa are surrounded by a respective reflective cup.

81. The light-emitting structure according to claim 80, wherein an inside wall of each of the reflective cups is stair-shaped.

82. The light-emitting structure according to any one of claims 80-81, wherein the first light-emitting mesa includes:

a first light-emitting layer;

a first bottom bonding layer, formed at a bottom of the first light-emitting layer and bonded with the semiconductor substrate;

a top electrode layer, covering the first light-emitting layer and electrically connected with a first reflective cup of the reflective cups; and,

wherein the second light emitting mesa includes:

a second light emitting layer;

a second bottom bonding layer, formed at a bottom of the second light emitting layer and bonded with the semiconductor substrate;

the top electrode layer, also covering the second light emitting layer and electrically connected with a second reflective cup of the reflective cups, wherein the reflective cups are electrically connected with the semiconductor substrate.

83. The light emitting structure according to any one of claims 75-82, further comprising a spacer covering the first light emitting mesa and the second light emitting mesa, wherein the spacer is formed between the first light emitting mesa and the first micro-lens, and the spacer is also formed between the second light emitting mesa and the second micro-lens.

84. The light emitting structure according to claim 83, wherein a height of the spacer is less than a height of the first micro-lens.

85. The light emitting structure according to any one of claims 75-84, wherein a horizontal dimension of the third micro-lens is less than a horizontal dimension of a bottom surface of the second micro-lens.

86. The light emitting structure according to any one of claims 75-85, wherein a central axis of the second micro-lens is coaxially aligned with a central axis of the second light emitting mesa, and a vertical axis of the third micro-lens is not coaxially aligned with the central axis of the second light emitting mesa, the vertical axis passing a center point of the third micro-lens when the third micro-lens is a complete shape.

87. The light emitting structure according to any one of claims 75-86, wherein the light emitting structure includes more than one set of light emitting mesa, first micro-lens and second micro-lens, and a position of a respective first micro-lens relative to a respective second micro-lens on the light emitting structure within a respective set is different.

88. The light emitting structure according to any one of claims 86-87, wherein an offset distance between the vertical axis of the third micro-lens and the central axis of the second light emitting mesa is not more than 1.5 μm.

89. The light-emitting structure according to any one of claims 75-88, wherein a bottom surface of the second micro-lens intersects with a central axis of the second light emitting mesa

90. The light emitting structure according to claim 89, wherein a bottom surface of the first micro-lens does not intersect with a central axis of the first light emitting mesa.

91. The light emitting structure according to any one of claims 89-90, wherein material of the second micro-lens is the same as material of the third micro-lens, and material of the first micro-lens is the same as the material of the second micro-lens.

92. The light emitting structure according to any one of claims 86-91, wherein an offset distance between the central axis of the first micro-lens and the central axis of the first light emitting mesa is larger than an offset distance between the vertical axis of the third micro-lens and the central axis of the second light emitting mesa.

93. The light emitting structure according to any one of claims 80-92, wherein the semiconductor substrate is an IC substrate.

94. A light emitting structure with coaxial micro-lenses, comprising:

a light emitting mesa;

a first micro-lens, formed on the light emitting mesa; and,

a second micro-lens, covering and contacting the first micro-lens.

95. The light emitting structure with coaxial micro-lenses according to claim 94, wherein refractive index of the first micro-lens is higher than refractive index of the second micro-lens.

96. The light emitting structure with coaxial micro-lenses according to any one of claims 94-95, wherein material of the second micro-lens is different from material of the first micro-lens.

97. The light emitting structure with coaxial micro-lenses according to any one of claims 94-96, wherein the first micro-lens has a hemisphere structure, and the second micro-lens has a polygon structure without carve-out of the first micro-lens or composite structure without carve-out of the first micro-lens.

98. The light-emitting structure with coaxial micro-lenses according to claim 97, wherein the composite structure is a combination of a hemisphere structure and a trapezoid structure or a hemisphere structure and a triangle structure.

99. The light-emitting structure with coaxial micro-lenses according to claim 98, wherein the trapezoid structure is formed at a bottom of the hemisphere structure, or, the triangle structure is formed at the bottom of the hemisphere structure.

100. The light-emitting structure with coaxial micro-lenses according to any one of claims 97-99, wherein the polygon structure is a trapezoid structure having an inclined top surface relative to a bottom surface of the trapezoid structure.

101. The light-emitting structure with coaxial micro-lenses according to any one of claims 94-100, wherein a central axis of the first micro-lens and a central axis of the second micro-lens is coaxially aligned with a central axis of the light-emitting mesa.

102. The light-emitting structure with coaxial micro-lenses according to any one of claims 94-101, further comprising a semiconductor substrate and a reflective cup, wherein the light-emitting mesa is formed on the semiconductor substrate, and the light-emitting mesa is surrounded by the reflective cup.

103. The light-emitting structure with coaxial micro-lenses according to claim 102, wherein inside wall of the reflective cup is stair-shaped.

104. The light-emitting structure with coaxial micro-lenses according to any one of claims 102-103, wherein the light-emitting mesa includes:

a light-emitting layer,

a bottom bonding layer, at a bottom of the light-emitting layer and bonded with the semiconductor substrate, and,

a top electrode layer, covering the light-emitting mesa and electrically connected with the reflective cup, wherein the reflective cup is electrically connected with the semiconductor substrate.

105. The light-emitting structure with coaxial micro-lenses according to any one of claims 94-104, further comprising a spacer, formed above the light-emitting mesa.

~~106. The light-emitting structure with coaxial micro-lenses according to claim 105, wherein height of the spacer is less than height of the first micro-lens or height of the second micro-lens.~~

~~107. The light-emitting structure with coaxial micro-lenses according to any one of claims 102-106, wherein the semiconductor substrate is an IC substrate.~~

~~108. A light-emitting structure with an elliptical micro-lens structure, comprising:~~

~~a light-emitting mesa;~~

~~at least an elliptical micro-lens, formed above the light-emitting mesa, wherein a central axis of the elliptical micro-lens is not coaxially aligned with a central axis of the light-emitting mesa.~~

~~109. The light-emitting structure according to claim 108, wherein the elliptical micro-lens is formed by a quarter of sphere combined with a quarter of ellipsoid.~~

~~110. The light-emitting structure according to claim 109, wherein a radius of the sphere is not more than 9 μm, and a long radius of the ellipsoid is not more than 18 μm.~~

~~111. The light-emitting structure according to any one of claims 109-110, wherein an offset distance of a center of the elliptical micro-lens from a center of the light-emitting mesa in a horizontal level is not more than 4.5 μm.~~

~~112. The light-emitting structure according to any one of claims 108-111, wherein material of the elliptical micro-lens is silicon oxide or organic materials.~~

~~113. The light-emitting structure according to any one of claims 108-112, wherein a bottom surface of the elliptical micro-lens intersects with the central axis of the light-emitting mesa.~~

~~114. The light-emitting structure according to any one of claims 108-113, further comprising a semiconductor substrate and a reflective cup, wherein the light-emitting mesa is formed on the semiconductor substrate, and the light-emitting mesa is surrounded by the reflective cup.~~

~~115. The light-emitting structure according to claim 114, wherein inside wall of the reflective cup is stair-shaped.~~

~~116. The light-emitting structure according to any one of claims 114-115, wherein~~

the light emitting mesa includes:

a light emitting layer,

a bottom bonding layer, at a bottom of the light emitting layer and bonded with the semiconductor substrate, and

a top electrode layer, covering the light emitting mesa and electrically connected with the reflective cup, wherein the reflective cup is electrically connected with the semiconductor substrate.

117. The light emitting structure according to any one of claims 108-116, further comprising a spacer, formed between the light emitting mesa and the elliptical micro-lens.

118. The light emitting structure according to claim 117, wherein height of the spacer is less than height of the elliptical micro-lens.

119. The light emitting structure according to any one of claims 117-118, wherein height of the spacer is less than 5 μm.

120. The light emitting structure according to any one of claims 114-119, wherein the semiconductor substrate is an IC substrate.

121. A light emitting structure with a micro-lens composite structure, comprising:

a light emitting mesa; and

a micro-lens composite structure, comprising:

at least a micro-lens, formed above the light emitting mesa; and,

a reflective part, formed on one side of the micro-lens.

122. The light emitting structure according to claim 121, wherein the micro-lens is a sphere with a breach at a surface of the micro-lens.

123. The light emitting structure according to claim 122, wherein the reflective part is formed on a surface of the breach.

124. The light emitting structure according to claim 123, wherein the breach has an inclined surface relative to a bottom surface of the micro-lens, and, the reflective part is a plane structure attached on the inclined surface.

125. The light emitting structure according to any one of claims 123-124, wherein

the breach is a depression, and, the reflective part is attached to a surface of the depression.

126. The light-emitting structure according to any one of claims 121-125, wherein material of the micro-lens is silicon oxide or organic materials.

127. The light-emitting structure according to any one of claims 121-126, wherein a bottom surface of the micro-lens intersects with a central axis of the light-emitting mesa.

128. The light-emitting structure according to any one of claims 121-127, further comprising a semiconductor substrate and a reflective cup, wherein the light-emitting mesa is formed on the semiconductor substrate and the light-emitting mesa is surrounded by the reflective cup.

129. The light-emitting structure according to claim 128, wherein inside wall of the reflective cup is stair-shaped.

130. The light-emitting structure according to any one of claims 128-129, wherein the light-emitting mesa includes:

a light-emitting layer,

a bottom bonding layer, at a bottom of the light-emitting layer and bonded with the semiconductor substrate, and

a top-electrode layer, covering the light-emitting mesa and electrically connected with the reflective cup, wherein the reflective cup is electrically connected with the semiconductor substrate.

131. The light-emitting structure according to any one of claims 121-130, further comprising a spacer, formed between the light-emitting mesa and the micro-lens.

132. The light-emitting structure according to claim 131, wherein height of the spacer is less than height of the micro-lens.

133. The light-emitting structure according to any one of claims 128-132, wherein the semiconductor substrate is an IC substrate.

134. A light-emitting structure, comprising:

a light-emitting mesa;

a micro-lens formed on the light-emitting mesa; and

~~a diffraction lens covering the micro-lens.~~

~~135. The light-emitting structure according to claim 134, wherein material of the micro-lens is different from material of the diffraction lens.~~

~~136. The light-emitting structure according to any one of claims 134-135, wherein the diffraction lens is a Bragg mirror.~~

~~137. The light-emitting structure according to any one of claims 134-136, wherein a center point of a top surface of the diffraction lens is on a central axis of the micro-lens.~~

~~138. The light-emitting structure according to claim 137, wherein a central axis of the diffraction lens is inclined relative to a vertical axis perpendicular to a substrate of the light emitting structure and the central axis of the micro-lens is vertical relative to the vertical axis perpendicular to the substrate of the light emitting structure.~~

~~139. The light-emitting structure according to any one of claims 134-138, wherein the micro-lens has a hemisphere structure, and the diffraction lens has a polygon structure or a composite structure.~~

~~140. The light-emitting structure according to claim 139, wherein the composite structure comprises a combination of a hemisphere structure and a trapezoid structure or a combination of a hemisphere structure and a triangle structure.~~

~~141. The light-emitting structure according to claim 140, wherein the trapezoid structure is formed at a bottom of the hemisphere structure, or the triangle structure is formed at the bottom of the hemisphere structure.~~

~~142. The light-emitting structure according to any one of claims 139-141, wherein the polygon structure is a trapezoid structure comprising an inclined top surface relative to a bottom surface of the trapezoid structure.~~

~~143. The light-emitting structure according to any one of claims 134-142, wherein a central axis of the micro-lens and an axis passing through a center point of a top surface of the diffraction lens are coaxially aligned with a central axis of the light emitting mesa.~~

~~144. The light-emitting structure according to any one of claims 134-143, further comprising a semiconductor substrate and at least one reflective cup, wherein the light emitting~~

~~mesa is formed on the semiconductor substrate, and the light-emitting mesa is surrounded by the at least one reflective cup.~~

~~145. The light-emitting structure according to claim 144, wherein an inside wall of the reflective cup is stair-shaped.~~

~~146. The light-emitting structure according to any one of claims 144-145, wherein the light emitting mesa includes:~~

~~a light-emitting layer,~~

~~a bottom bonding layer at a bottom of the light emitting layer and bonded with the semiconductor substrate, and~~

~~a top electrode layer, covering the light emitting mesa and electrically connected with the at least one reflective cup, and wherein the at least one reflective cup is electrically connected with the semiconductor substrate.~~

~~147. The light-emitting structure according to any one of claims 134-146, further comprising a spacer covering the light emitting mesa.~~

~~148. The light-emitting structure according to claim 147, wherein a height of the spacer is less than a height of the micro-lens.~~

~~149. The light-emitting structure according to any one of claims 144-148, wherein the semiconductor substrate is an IC substrate.~~

~~150. A light emitting structure with an off-axis micro-lens structure, comprising:~~

~~a light emitting mesa; and~~

~~at least a micro-lens, formed above the light emitting mesa, wherein a central axis of the micro-lens is not coaxially aligned with a central axis of the light emitting mesa.~~

~~151. The light-emitting structure according to claim 150, wherein an offset distance of the central axis of the micro-lens from the central axis of the light emitting mesa is not more than 4.5 μm.~~

~~152. The light emitting structure according to any one of claims 150-151, wherein an offset distance between an edge of a bottom surface of the light emitting mesa and an edge of a bottom surface of the micro-lens is within 30% of a diameter of the bottom surface of the~~

~~first micro-lens.~~

~~153. The light-emitting structure according to any one of claims 150-152, wherein material of the micro-lens is silicon oxide or organic materials.~~

~~154. The light-emitting structure according to any one of claims 150-153, wherein a bottom surface of the micro-lens intersects with the central axis of the light-emitting mesa.~~

~~155. The light-emitting structure according to any one of claims 150-154, further comprising a semiconductor substrate and a reflective cup, wherein the light-emitting mesa is formed on the semiconductor substrate, and the light-emitting mesa is surrounded by the reflective cup.~~

~~156. The light-emitting structure according to claim 155, wherein inside wall of the reflective cup is stair-shaped.~~

~~157. The light-emitting structure according to any one of claims 155-156, wherein the light-emitting mesa includes:~~

~~a light-emitting layer,~~

~~a bottom bonding layer, at a bottom of the light-emitting layer and bonded with the semiconductor substrate, and~~

~~a top electrode layer, covering the light-emitting mesa and electrically connected with the reflective cup, wherein the reflective cup is electrically connected with the semiconductor substrate.~~

~~158. The light-emitting structure according to any one of claims 150-157, further comprising a spacer, formed between the light-emitting mesa and the micro-lens.~~

~~159. The light-emitting structure according to claim 158, wherein height of the spacer is less than height of the micro-lens.~~

~~160. The light-emitting structure according to any one of claims 155-159, wherein the semiconductor substrate is an IC substrate.~~