CLAIMS

1. A LED light bulb, comprising:

a LED light bulb shell (1);

a core column (5) with an exhaust tube (2);

at least one LED light emitting strip (6, 27, 33, 40) with LED chips (16, 16a, 34) emitting 4π light;

a driver (7); and

an electrical connector (8), characterized in that,

the LED light bulb shell (1) is vacuum sealed with the core column (5) so as to form a vacuum sealed chamber (13), which is filled with a gas having a low coefficient of viscosity and a high coefficient of thermal conductivity, wherein the LED light emitting strips (6, 27, 33, 40) fixed on the core column (5) are housed in the vacuum sealed chamber, wherein the LED light emitting strip (6, 27, 33, 40) is in turn electrically connected to the driver (7), the electrical connector (8), the electrical connector (8) used to be electrically connected to an external power supply, so as to light the LED light emitting strips (6, 27, 33, 40).

2. The LED light bulb of claim 1, wherein

the core column (5) further comprises a bracket (42), and the bracket (42) and the LED light emitting strips (6, 27, 33, 40) fixed on the bracket (42) are housed in the vacuum sealed chamber.

3. The LED light bulb of claim 1 or 2, wherein the LED light bulb shell (1) is capable of transmitting light and connected to the electrical connector (8) directly or by a connecting piece (9), and a light reflecting plate (14a) is provided at an end of the LED light bulb shell (1) adjacent to the electrical connector (8), wherein the/a bracket (42) of the core column (5) comprises an electrical power lead (3, 3a, 29), a pillar (4) and a metal wire (11, 11a) for fixing

the LED light emitting strip (6, 27, 33, 40), electrodes at two ends of the LED light emitting strip (6, 27, 33, 40) are in turn electrically connected to the electrical connector (8) and the driver (7) outside of the vacuum sealed chamber via the electrical power lead (3, 3a, 29).

4. The LED light bulb of claim 1 or 2, wherein the gas having a low coefficient of viscosity and a high coefficient of thermal conductivity includes He, H_2, and a mixed gas of He and H_2, and at room temperature the gas has a gas pressure in the range of 50-1520 Torrs.

5. The LED light bulb of claim 1 or 2, wherein each of the at least one LED light emitting strips (6, 27, 33, 40) has at least one series of LED chips (16, 16a, 34) connected in series in such a manner that the PN junctions therein have a same direction, and the number of the LED chips (6, 27, 33, 40) is sufficient large such that their driving voltage is close to an external driving voltage after LED light emitting strips (6, 27, 33, 40) are connected in series or in parallel and series, the total driving voltage is 20-100% of a peak value of AC voltage or a voltage of DC power supply.

6. The LED light bulb of claim 1 or 2, wherein the LED light emitting strips (6, 27, 33, 40) are connected in series or in series and parallel, while working in a bidirectional AC mode or a unidirectional DC mode, and arrangement of the light emitting strips is in the form of V, W, column, cone, or plane.

7. The LED light bulb of claim 1 or 2, wherein the respective LED light emitting strips (6, 27, 33, 40) interlace with each other or the respective LED light emitting strips (6, 27, 33, 40) interlace with each other and be located in diagonal lines of respective faces of a virtual polyhedral column or polyhedral truncated cone (41), so that any two strips of the LED light emitting strips (6, 27,

33, 40) are not located in a same plane, so as to avoid generating shadow on the LED light bulb shell (1) caused by blocking light emitted from one of the LED light emitting strips (6, 27, 33, 40) by means of another LED light emitting strip (6, 27, 33, 40).

8. The LED light bulb of claim 1 or 2, wherein the LED light emitting strip (6, 27, 33, 40) with the LED chips (16, 16a, 34) emitting 4π light, comprises:

a transparent substrate (15);

an electrode leading device (17) of the LED chips provided at two ends of the transparent substrate (15);

a fixing means (19) for fixing the electrode leading device at the two ends of the transparent substrate (15), and wherein the fixing means (19) is made of high temperature glue, plastics, silver slurry or low melting glass; and

at least one series of the LED chips (16, 16a, 34) installed on the transparent substrate (15) and connected in series in such a manner that the PN junctions (24, 35) therein have a same direction, and the LED chips (16, 16a, 34) having transparent chip substrates,

wherein the LED chips (16, 16a, 34) are LED chips or high voltage LED chips having a same luminescent color or different luminescent colors, the LED chips are independently and separately fixed on the transparent substrate (15) by transparent glue (22), and wherein the transparent substrate (15) of the LED light emitting strip (16, 16a) is made of soft glass, hard glass, quartz glass, transparent ceramics or plastics.

9. The LED light bulb of claim 8, wherein the LED chips (16, 16a, 34) are blue-light or ultra-violet LED chips, RGB three primary colors LED chips(16, 16a, 34) or multi-primary colors LED chips (16, 16a, 34).

10. The LED light bulb of claim 8, wherein the LED light bulb is comprised of any one of the following items (I)-(IV):

(I) the LED light bulb further comprising a luminescent powder layer (26) disposed around the LED chips (16) and the transparent substrate (15) installed with the LED chips (16);

(II) the LED light bulb further comprising a first transparent dielectric layer (25) disposed on a surface of the transparent substrate (15) on which the LED chips (16) are installed and on the LED chips (16);

(III) the LED light bulb further comprising a luminescent powder layer (26) disposed around the transparent dielectric layer (25) and the transparent substrate (15) installed with the LED chips (16); and

(IV) the LED light bulb further comprising another transparent dielectric layer (25a) and a luminescent powder layer (26) in turn disposed around the first transparent dielectric layer (25) and the transparent substrate (15) installed with the LED chips (16).

11. The LED light bulb of claim 8, further comprising a transparent dielectric layer (25) and a luminescent powder layer (26) in turn disposed around the LED chips (16) and the transparent substrate (15) installed with the LED chips (16) or further comprising a luminescent powder layer (26) and a transparent dielectric layer (25) in turn disposed around the LED chips (16) and the transparent substrate (15) installed with the LED chips (16).

12. The LED light bulb of claim 10, wherein the luminescent powder layer (26, 26a) is made by mixing luminescent powder and transparent dielectric, the transparent dielectric comprising any one of silicon glue, epoxy resin, plastics, transparent glue, transparent lacquer and polymer, or the combination thereof.

13. The LED light bulb of claim 8, wherein the LED chips (16, 16a) and the transparent substrate (15) are enclosed by a transparent tube (28) or a transparent luminescent powder tube (28) at an outermost side of the LED chips (16) and the transparent substrate (15), wherein a luminescent powder layer (32) is provided on an inner or outer wall of the transparent tube (28), and the transparent tube (28) is of glass, plastics or silicon glue,

wherein the LED light bulb further comprising a dielectric (31) having a high coefficient of light transmissivity, a high coefficient of thermal conductivity and a high refractive index, between the transparent tube (28) and the LED chips (16, 16a) and the transparent substrate (15), wherein the dielectric comprises transparent silicon glue, epoxy resin or plastics.

What the claims is:

1. A LED light bulb, comprising:

a LED light bulb shell;

a core column with an exhaust tube and a bracket;

at least one LED light emitting strip with LED chips emitting 4p light;

a driver; and

an electrical connector,

wherein the LED light bulb shell is vacuum sealed with the core column so as to form a vacuum sealed chamber, which is filled with a gas having a low coefficient of viscosity and a high coefficient of thermal conductivity, wherein the bracket and the LED light emitting strips fixed on the bracket are housed in the vacuum sealed chamber, wherein the LED light emitting strip is in turn electrically connected to the driver, the electrical connector, the electrical connector used to be electrically connected to an external power supply, so as to light the LED light emitting strips.

2. The LED light bulb of claim 1, wherein the LED light bulb shell is capable of transmitting light and connected to the electrical connector directly or by a connecting piece.

3. The LED light bulb of claim 1, wherein the bracket of the core column comprises an electrical power lead, a pillar and a metal wire for fixing the LED light emitting strip, electrodes at two ends of the LED light emitting strip are in turn electrically connected to the electrical connector and the driver outside of the vacuum sealed chamber via the electrical power lead.

4. The LED light bulb of claim 1, wherein the gas having a low coefficient of viscosity and a high coefficient of thermal conductivity includes He, H_2, and a mixed gas of He and H_2, and at room temperature the gas has a gas pressure in the range of 50-1520Torrs.

5. The LED light bulb of claim 1, wherein each of the at least one LED light emitting strips has at least one series of LED chips connected in series in such a manner that the PN junctions therein have a same direction, and the number of the LED chips is sufficient large such that their driving voltage is close to an external driving voltage after LED light emitting strips are connected in series or in parallel and series.

6. The LED light bulb of the claim 5, wherein the total driving voltage is 20-100% of a peak value of AC voltage or a voltage of DC power supply.

7. The LED light bulb of claim 1, wherein the number of the LED light emitting strips is not less than two, and the LED light emitting strips are connected to work in a bidirectional AC mode, wherein the at least one LED light emitting strip is conducted in a forward direction while the at least one further LED light emitting strip is conducted in a reverse direction, alternation of the forward and reverse directions of AC in turn allowing the LED light emitting strip to be alternatively conducted and to emit light.

8. The LED light bulb of claim 1, wherein the at least one LED light emitting strip is connected to work in a unidirectional DC mode.

9. The LED light bulb of claim 1, wherein the LED light emitting strips are connected in series or in series and parallel, and arrangement of the light emitting strips is in the form of V, W, column, cone, or plane.

10. The LED light bulb of claim 1, wherein the respective LED light emitting strips interlace with each other, so that any two strips of the LED light emitting strips are not located in a same plane, so as to avoid generating shadow on the LED light bulb shell caused by blocking light emitted from one of the LED light emitting strips by means of another LED light emitting strip.

11. The LED light bulb of claim 1 or 10, wherein the LED light emitting strips interlace with each other so as to be located in diagonal lines of respective faces of a virtual polyhedral column or polyhedral truncated cone.

12. The LED light bulb of claim 1, wherein the LED light bulb shell is transparent, creamy, frosted or colored, or a part of the bulb shell has a reflective layer or a series of small prisms or lens; and the LED light bulb shell has a shape of A, G, R, PAR, T, candle, P, PS, BR, ER, or BRL type.

13. The LED light bulb of claim 1, wherein a light reflecting plate is provided at an end of the LED light bulb shell adjacent to the electrical connector.

14. The LED light bulb of claim 1, wherein the electrical connector is any one of the electrical connectors of E40, E27, E26, E14, GU, BX, BA, EP, EX, GY, GX, GR, GZ, and G types of the light bulb.

15. The LED light bulb of claim 1, wherein the LED light emitting strip with the LED chips emitting 4p light, comprises a transparent substrate and at least one series of the LED chips installed on the transparent substrate and connected in series in such a manner that the PN junctions therein have a same direction, and the LED chips having transparent chip substrates.

16. The LED light bulb of claim 15, further comprising an electrode leading device of the LED chips provided at two ends of the transparent substrate.

17. The LED light bulb of claim 15, wherein the LED chips are independently and separately fixed on the transparent substrate by transparent glue, and wherein the transparent substrate of the LED light emitting strip is made of soft glass, hard glass, quartz glass, transparent ceramics or plastics.

18. The LED light bulb of claim 16, further comprising a fixing means for fixing the electrode leading device at the two ends of the transparent substrate, and wherein the fixing means is made of high temperature glue, plastics, silver slurry or low melting glass.

19. The LED light bulb of claim 15, wherein the LED chips have a same luminescent color or different luminescent colors.

20. The LED light bulb of claim 15, wherein the LED chips are blue-light or ultra-violet LED chips, RGB three primary colors LED chips or multi-primary colors LED chips.

21. The LED light bulb of claim 15, wherein a part of the LED chips are blue-light LED chips while the other part of the LED chips are red-light LED chips.

22. The LED light bulb of claim 20 or 21, further comprising a luminescent powder layer disposed around the LED chips and the transparent substrate installed with the LED chips.

23. The LED light bulb of claim 20 or 21, further comprising a first transparent dielectric layer disposed on a surface of the transparent substrate on which the LED chips are installed and on the LED chips.

24. The LED light bulb of claim 23, further comprising a luminescent powder layer disposed around the transparent dielectric layer and the transparent substrate installed with the LED chips.

25. The LED light bulb of claim 23, further comprising another transparent dielectric layer and a luminescent powder layer in turn disposed around the first

transparent dielectric layer and the transparent substrate installed with the LED chips.

26. The LED light bulb of claim 20 or 21, further comprising a transparent dielectric layer and a luminescent powder layer in turn disposed around the LED chips and the transparent substrate installed with the LED chips.

27. The LED light bulb of claim 20 or 21, further comprising a luminescent powder layer and a transparent dielectric layer in turn disposed around the LED chips and the transparent substrate installed with the LED chips.

28. The LED light bulb of any one of claims 22-27, wherein the luminescent powder layer is made by mixing luminescent powder and transparent dielectric, the transparent dielectric comprising any one of silicon glue, epoxy resin, plastics, transparent glue, transparent lacquer and polymer, or the combination thereof.

29. The LED light bulb of claim 15, wherein the LED chips and the transparent substrate are enclosed by a transparent tube at an outermost side of the LED chips and the transparent substrate.

30. The LED light bulb of claim 29, wherein a luminescent powder layer is provided on an inner or outer wall of the transparent tube.

31. The LED light bulb of claim 29, wherein the transparent tube is of glass, plastics or silicon glue.

32. The LED light bulb of claim 15, wherein the LED chips and the transparent substrate are enclosed by a transparent luminescent powder tube at an outermost side of the LED chips and the transparent substrate.

33. The LED light bulb of claim 29, further comprising a dielectric having a high coefficient of light transmissivity, a high coefficient of thermal conductivity and a high refractive index, between the transparent tube and the LED chips and the transparent substrate, wherein the dielectric comprises transparent silicon glue, epoxy resin or plastics.

34. The LED light bulb of claim 22 or 23, wherein the LED chips are high voltage LED chips, which each comprises at least two LED PN junctions connected in series.

35. A LED light emitting strip with LED chips emitting 4p light, wherein the LED light emitting strip comprises a transparent substrate and at least one series of LED chips on the transparent substrate and connected in series in such a manner that the PN junctions therein have a same direction, the LED chips having transparent chip substrates, electrodes of the LED chips being led by an electrode leading device of the LED chips disposed at two ends of the transparent substrate, wherein the transparent substrate is made of soft glass, hard glass, quartz glass, transparent ceramics or plastics.

36. A LED light emitting strip with LED chips emitting 4p light, wherein the LED light emitting strip comprises a transparent substrate and at least one series of LED chips on the transparent substrate and connected in series in such a manner that the PN junctions therein have a same direction, the LED chips having transparent chip substrates, electrodes of the LED chips being led by an electrode leading device of the LED chips disposed at two ends of the transparent substrate, wherein a part of the LED chips are blue-light LED chips, while the other part of the LED chips are red-light LED chips, a luminescent powder layer is disposed around the LED chips and the transparent substrate installed with the LED chips to convert a part of blue light emitted from the LED chips into yellow light, the other part of blue light is mixed with the yellow light and the red light to create white light, white light

having high color rending index or other colored light.

37. A LED light emitting strip with LED chips emitting 4p light, wherein the LED light emitting strip comprises a transparent substrate and at least one series of LED chips on the transparent substrate and connected in series in such a manner that the PN junctions therein have a same direction, the LED chips having transparent chip substrates, electrodes of the LED chips being led by an electrode leading device of the LED chips disposed at two ends of the transparent substrate, wherein the LED chips and the transparent substrate are enclosed by a transparent tube or a transparent luminescent powder tube at an outermost side of the LED chips and the transparent substrate.

38. The LED light emitting strip with the LED chips emitting 4p light of claim 37, wherein a luminescent powder layer is disposed on an inner or outer wall of the transparent tube.

39. A LED light emitting strip with LED chips emitting 4p light, wherein the LED light emitting strip comprises a transparent substrate and at least one series of LED chips on the transparent substrate and connected in series in such a manner that the PN junctions therein have a same direction, the LED chips having transparent chip substrates, electrodes of the LED chips being led by an electrode leading device of the LED chips disposed at two ends of the transparent substrate, wherein the LED chips are transparent high voltage LED chips, which each includes at least two LED PN junctions connected in series .

40. The LED light emitting strip with the LED chips emitting 4p light of claim 39, wherein at least one electrical connection wire is provided between any two of the LED PN junctions, at least one metal electrode for welding and wire bonding is provided at two ends of each high voltage LED chip, at least one electrical connection wire is provided between any two of the high voltage LED chips and

between the high voltage LED chip and a power lead of the high voltage LED light emitting strip.