CLAIMS

We claim:

1. A method of manufacturing a light emitting die, comprising:

forming a light emitting structure on a growth substrate;

forming an embedded contact electrically coupled to the first semiconductor material at a first side; and

plating a metal at the first side, wherein the plated metal forms a plated substrate having a thickness sufficient to inhibit bowing of the light emitting structure.

2. The method of claim 1 wherein:

the first semiconductor material comprises a p-type gallium nitride ("p-GaN") material, the second semiconductor material comprises a n-type gallium nitride ("n-GaN") material, and the active region comprises an indium gallium nitride ("InGaN") material;

the embedded contact comprises a p-contact electrically coupled to the p-GaN material; and

the method further comprises attaching a carrier to the plated substrate, removing the growth substrate from the light emitting structure, and forming exterior contacts electrically coupled to the n-GaN material.

3. The method of claim 2 wherein:

the embedded contact is a reflective material;

the plated substrate comprise copper; and

the thickness of the plated substrate is approximately 50–150 microns.

4. The method of claim 1, further comprising:

depositing a barrier material on the embedded contact;

forming a seed material on the barrier material; and

plating the metal on the seed material.

5. The method of claim 1 wherein plating the metal at the first side of the light emitting structure comprises depositing a barrier material on the embedded contact, forming a seed material on the barrier material, and plating the metal on the seed material

6. The method of claim 1 wherein the thickness of the plated substrate is approximately 50–300 microns.

7. The method of claim 1 wherein the thickness of the plated substrate is approximately 75–150 microns.

8. The method of claim 1, further comprising removing a carrier and dicing through the plated substrate, a barrier material, the embedded contact, and the light emitting structure to form individual SSL devices.

9. The method of claim 1 wherein the growth substrate is at least approximately six inches in diameter.

10. The method of claim 1 wherein the light emitting structure comprises a first semiconductor material, a second semiconductor material, and an active region between the first and second semiconductor materials.

11. A method of manufacturing solid state lighting devices, comprising:

forming a light emitting structure on a generally circular growth substrate, wherein the growth substrate and the light emitting structure are at least approximately six inches in diameter;

etching a plurality of trenches in the light emitting structure that separate the light emitting structure into individual mesas;

forming a plated substrate on the individual mesas and in the trenches such that a first side of the plated substrate faces toward the mesas and a second side opposite the first side faces away from the mesas;

attaching a carrier to the second side of the plated substrate; and

removing the growth substrate from the light emitting structure.

12. The method of claim 11, further comprising:

forming an embedded contact at the first side of the light emitting structure before forming the plated substrate; and

forming a barrier on the embedded contact, wherein etching the trenches comprises forming V-shaped trenches through the light emitting structure, the embedded contact, and the barrier.

13. The method of claim 11 wherein etching the plurality of trenches comprises etching through the light emitting structure to expose a portion of the growth substrate.

14. The method of claim 11 wherein etching the plurality of trenches in the light emitting structure comprises using a wet etch that penetrates to the growth substrate.

15. The method of claim 11, further comprising forming dielectric liners in the plurality of trenches that electrically isolate the light emitting structure from the plated substrate.

16. A wafer having a plurality of individual solid state lighting devices, comprising:

a light emitting structure comprising a first semiconductor material on a first side, a second semiconductor material on a second side, and an active region between the first and second semiconductor materials;

an embedded contact at the first side;

a plated substrate formed on the embedded contact, wherein the plated substrate has a thickness sufficient to inhibit bowing of the light emitting structure; and

a plurality of exterior contacts formed on the second side of the light emitting structure, wherein the wafer is at least approximately 150 millimeters in diameter.

17. The wafer of claim 16 wherein the wafer is between approximately 150–300 millimeters in diameter.

18. The wafer of claim 16 wherein the wafer has trenches in the light emitting structure and the plated substrate comprises a plurality of projections protruding from the plated substrate into the trenches.

19. The wafer of claim 16, further comprising at least one of a barrier material and a reflective material between the plated substrate and the embedded contact.

20. The wafer of claim 16 wherein the plated substrate has a thickness of about 50–300μm.

21. The wafer of claim 16 wherein the plated substrate has a thickness of about 100–150μm.

CLAIMS

We claim:

1. A method of manufacturing solid state lighting devices, comprising:

forming a light emitting structure on a circular growth substrate, wherein the growth substrate and the light emitting structure are at least six inches in diameter, wherein the light emitting structure has a first face facing the growth substrate and a second face facing away from the growth substrate;

forming an embedded contact having a first side in physical contact and electrically coupled to the second face of the light emitting structure, the embedded contact having a second side opposite the first side;

etching a plurality of V-shaped trenches through the embedded contact and into the light emitting structure, wherein the trenches separate the light emitting structure into individual mesas;

lining entire surface of each of the plurality of the individual trenches with a dielectric liner, wherein the dielectric liner ends at the second side of the embedded contact;

forming a plated substrate on the individual mesas at the second side of the embedded contact and filling the trenches, wherein a first side of the plated substrate faces toward the mesas and a second side opposite the first side faces away from the mesas;

attaching a carrier to the second side of the plated substrate;

removing the growth substrate from the light emitting structure; and

forming exterior contacts at the first face of the light emitting structure.

2. The method of claim 1, further comprising:

forming a barrier on the embedded contact, wherein etching the V-shaped trenches comprises forming V-shaped trenches through the light emitting structure, the embedded contact, and the barrier.

3. The method of claim 1 wherein etching the plurality of trenches comprises etching through the light emitting structure to expose a portion of the growth substrate.

4. The method of claim 1 wherein etching the plurality of trenches in the light emitting structure comprises using a wet etch that penetrates to the growth substrate.