CLAIMS

1. A vertical light emitting diode comprising:

a light emitting diode structure including:

a first material layer of a first conductivity type;

a second material layer of a second conductivity type; and

a light emitting layer disposed in between the first material layer and the second material layer;

wherein a surface of the first material layer has a plurality of generally ordered photonic nanostructures formed thereat using a self-assembled template for enhancing light extraction efficiency of the vertical light emitting diode, the self-assembled template comprising generally ordered nanoparticles on said surface of the first material layer to function as a mask for forming the photonic nanostructures at said surface of the first material layer.

2. The vertical light emitting diode according to claim 1, further comprises a first electrode formed on the second material layer, and a second electrode formed on the first material layer, wherein the first and second electrodes are configured to receive a bias voltage for providing power to the light emitting layer to generate light.

3. The vertical light emitting diode according to claim 1 or 2, wherein the first material layer is selected from a group consisting of an n-type GaN, an n-type AlGaN, and an n-type InAlGaN, the second material is selected from a group consisting of a p-type GaN, a p-type AlGaN, and a p-type InAlGaN, and the light emitting layer comprises one or more quantum wells of indium gallium nitride and gallium nitride (InGaN/GaN) heterostructures.

CLAIMS

1. A vertical light emitting diode comprising:

a light emitting diode structure including:

a first material layer of a first conductivity type;

a second material layer of a second conductivity type; and

a light emitting layer disposed in between the first material layer and the second material layer;

wherein a surface of the first material layer has a plurality of generally ordered photonic nanostructures formed thereat using a self-assembled template for enhancing light extraction efficiency of the vertical light emitting diode, the self-assembled template comprising generally ordered nanoparticles on said surface of the first material layer to function as a mask for forming the photonic nanostructures at said surface of the first material layer.

2. The vertical light emitting diode according to claim 1, further comprises a first electrode formed on the second material layer, and a second electrode formed on the first material layer, wherein the first and second electrodes are configured to receive a bias voltage for providing power to the light emitting layer to generate light.

3. The vertical light emitting diode according to claim 1 or 2, wherein the first material layer is selected from a group consisting of an n-type GaN, an n-type AlGaN, and an n-type InAlGaN, the second material is selected from a group consisting of a p-type GaN, a p-type AlGaN, and a p-type InAlGaN, and the light emitting layer comprises one or more quantum wells of indium gallium nitride and gallium nitride (InGaN/GaN) heterostructures.