

## **United States Patent** [19]

### Edmond et al.

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### [54] VERTICAL GEOMETRY LIGHT EMITTING DIODE WITH GROUP III NITRIDE ACTIVE LAYER AND EXTENDED LIFETIME

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[51] Int. Cl.<sup>6</sup> ...... H01L 31/0312; H01L 33/00

[52] **U.S. Cl.** ...... **257/77**; 257/96; 257/97; 257/103

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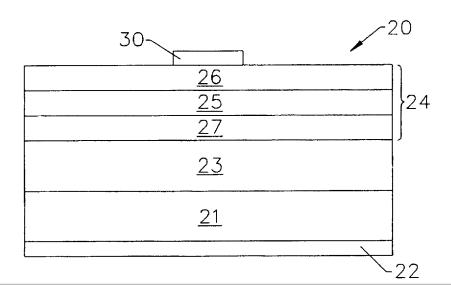
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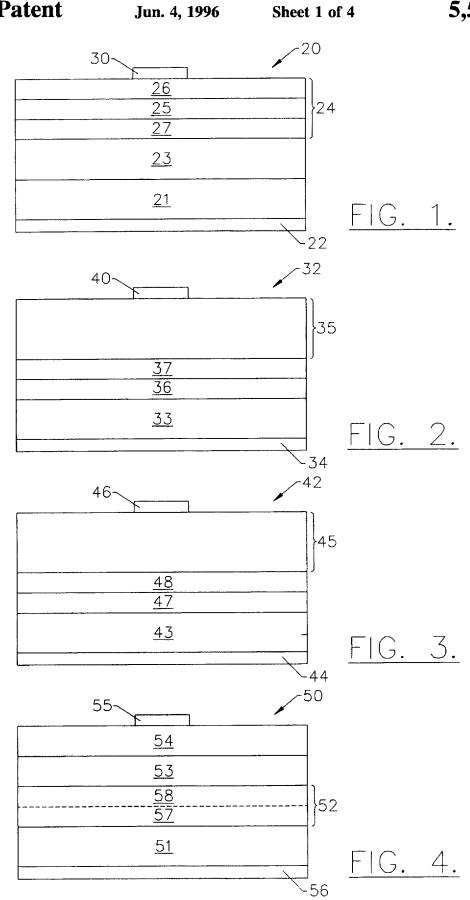
#### [57] ABSTRACT

A light emitting diode emits in the blue portion of the visible spectrum and is characterized by an extended lifetime. The light emitting diode comprises a conductive silicon carbide substrate; an ohmic contact to the silicon carbide substrate; a conductive buffer layer on the substrate and selected from the group consisting of gallium nitride, aluminum nitride, indium nitride, ternary Group III nitrides having the formula  $A_x B_{1-x} N$ , where A and B are Group III elements and where x is zero, one, or a fraction between zero and one, and alloys of silicon carbide with such ternary Group III nitrides; and a double heterostructure including a p-n junction on the buffer layer in which the active and heterostructure layers are selected from the group consisting of binary Group III nitrides and ternary Group III nitrides.

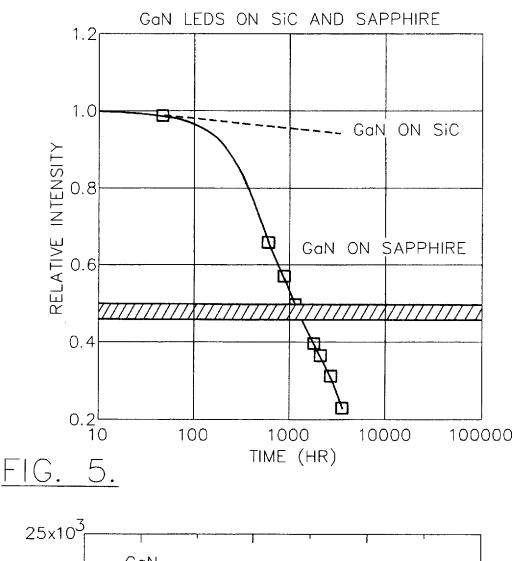
### 36 Claims, 4 Drawing Sheets

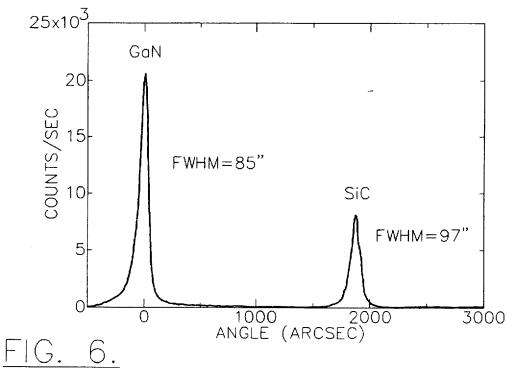




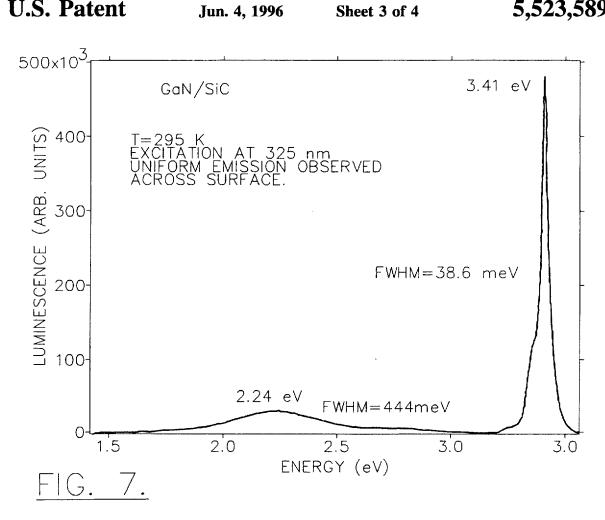


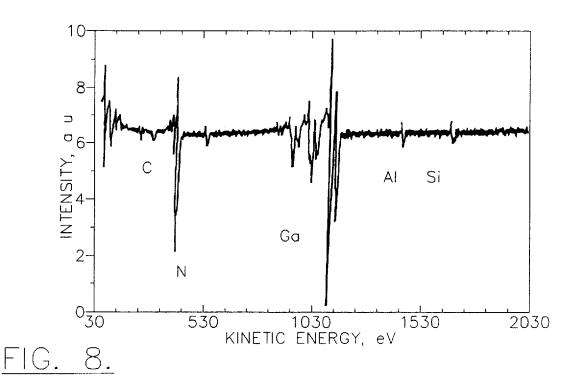
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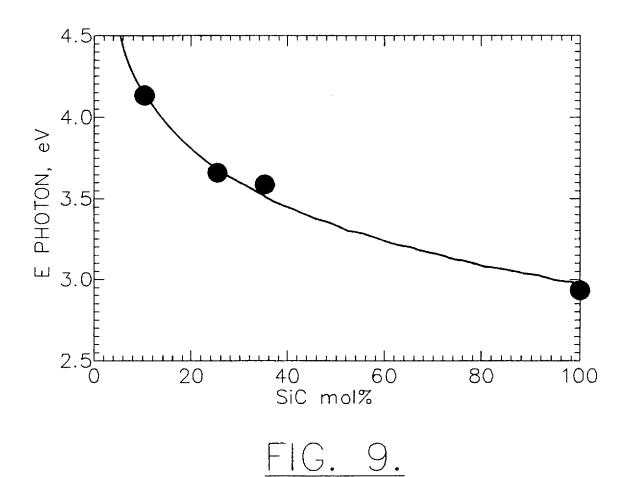












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