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MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
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(54) Title: MULTI-COLOR LIGHT EMITTING DEVICES WITH COMPOSITIONALLY GRADED CLADDING GROUP III-NITRIDE LAYERS GROWN ON SUBSTRATES

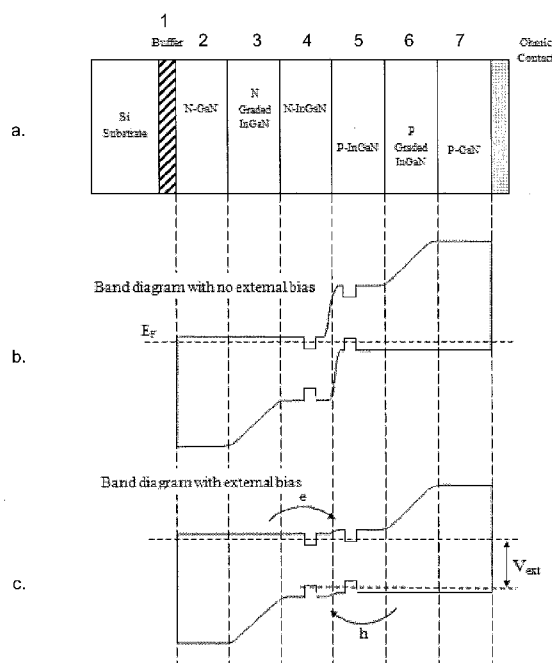


FIG. 1

(57) Abstract: A light emitting device includes a substrate, multiple n-type layers, and multiple p-type layers. The n-type layers and the p-type layers each include a group III nitride alloy. At least one of the n-type layers is a compositionally graded n-type group III nitride, and at least one of the p-type layers is a compositionally graded p-type group III nitride. A first ohmic contact for injecting current is formed on the substrate, and a second ohmic contact is formed on a surface of at least one of the p-type layers. Utilizing the disclosed structure and methods, a device capable of emitting light over a wide spectrum may be made without the use of phosphor materials.



GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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INTERNATIONAL SEARCH REPORT

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PCT/US2012/045482**A. CLASSIFICATION OF SUBJECT MATTER*****H01L 33/04(2010.01)i, H01L 33/08(2010.01)i, H01L 33/32(2010.01)i***

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01L 33/04; H01L 31/0328; H01L 33/00; H01S 5/00; H01S 5/34

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: LED, graded, cladding, indium

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2002-0195619 A1 (TOSHIKI MAKIMOTO et al.) 26 December 2002 See abstract; paragraphs [0055], [0101]–[0106]; and figures 6,14.	1-31
A	US 6515313 B1 (JAMES IBBETSON et al.) 04 February 2003 See column 9, line 10 – column 10, line 45 and figures 1,5,6.	1-31
A	US 6404791 B1 (RUI Q. YANG) 11 June 2002 See column 3, line 54 – column 6, line 48 and figures 1-4.	1-31
A	US 2006-0157730 A1 (KOJI OTSUKA et al.) 20 July 2006 See abstract, paragraphs [0027]–[0056], and figures 1-3.	1-31
A	US 2008-0144685 A1 (NELSON TANSU et al.) 19 June 2008 See abstract, paragraphs [0034]–[0082], and figures 1-10.	1-31
A	US 05045896A A (RICHARD M. ASH et al.) 03 September 1991 See abstract; column 2, line 8 – column 3, line 46; and figures 1,2,4,5.	1-31

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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