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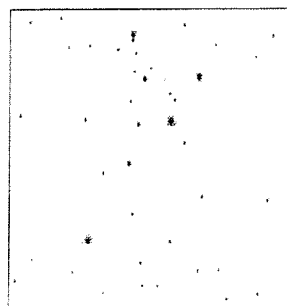
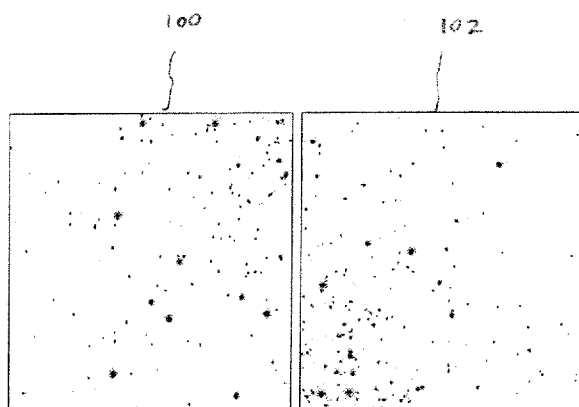
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(54) Title: LUMINESCENT MATERIALS THAT EMIT LIGHT IN THE VISIBLE RANGE OR THE NEAR INFRARED RANGE



(57) Abstract: Luminescent materials and the use of such materials in anti-counterfeiting, inventory, photovoltaic, and other applications are described herein. In one embodiment, a luminescent material has the formula: $[A_a B_b X_x X'_x X''_x] \text{[dopants]}$, wherein A is selected from at least one of elements of Group IA; B is selected from at least one of elements of Group VA, elements of Group IB, elements of Group IIB, elements of Group IIIB, elements of Group IVB, and elements of Group VB; X , X' , and X'' are independently selected from at least one of elements of Group VIIIB; the dopants include electron acceptors and electron donors; a is in the range of 1 to 9; b is in the range of 1 to 5; and x , x' , and x'' have a sum in the range of 1 to 9. The luminescent material exhibits photoluminescence having: (a) a quantum efficiency of at least 20 percent; (b) a spectral width no greater than 100 nm at Full Width at Half Maximum; and (c) a peak emission wavelength in the near infrared range.



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A. CLASSIFICATION OF SUBJECT MATTER

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USPC - 252/301.36, 301.4R

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)

USPC - 252/301.36, 301.4R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPTO, www.Answers.com, PubWEST, www.Google.comElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Electronic Databases: DB=PGPB,USPT,USOC,EPAB,JPAB; PLUR=NO; OP=ADJ; USPTO (Patents and Published Applications)
Search terms: Luminescent, photoluminescent, anion, cation, cesium, tin, bromine, chlorine, iodine, temperature, pressure, electron acceptor, peak, emission, wavelength, spectral, width, perovskite, infrared

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005/0107870 A1 (WANG et al.) 19 May 2005 (19.05.2005) para [0083], [0094], [0244], [0250], [0378], [0384]-[0390], [0392], [0402], [0468], [0475], [0794], [0818], [0821], [0822]; claim 42	14-21
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Y		1-13
Y	US 2003/0189401 A1 (KIDO et al.) 09 October 2003 (09.10.2003) para [0008], [0009], [0146], [0178], [0202], [0252], [0313], [0701], [0820], [1243], [1451]; Fig. 16	1-13

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"&" document member of the same patent family

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