

The  
United  
States  
of  
America



**The Director of the United States  
Patent and Trademark Office**

*Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.*

*Therefore, this*

**United States Patent**

*Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, or importing into the United States of America, products made by that process, for the term set forth in 35 U.S.C. 154(a)(2) or (c)(1), subject to the payment of maintenance fees as provided by 35 U.S.C. 41(b). See the Maintenance Fee Notice on the inside of the cover.*

*Michelle K. Lee*

*Director of the United States Patent and Trademark Office*



US008421373B2

(12) **United States Patent**  
**Chung et al.**

(10) **Patent No.:** **US 8,421,373 B2**  
(45) **Date of Patent:** **Apr. 16, 2013**

(54) **LIGHT-MIXING MULTICHIP PACKAGE STRUCTURE**

(56) **References Cited**

(75) Inventors: **Chia-Tin Chung**, Miaoli County (TW);  
**Shih-Neng Dai**, Taoyuan County (TW);  
**Chao-Chin Wu**, Taipei (TW)

U.S. PATENT DOCUMENTS  
6,340,824 B1 \* 1/2002 Komoto et al. .... 257/99  
8,018,151 B2 \* 9/2011 Chung et al. .... 313/506  
8,217,404 B2 \* 7/2012 Wu et al. .... 257/88  
2012/0097997 A1 \* 4/2012 Chung et al. .... 257/89  
2012/0268929 A1 \* 10/2012 Chung et al. .... 362/231

(73) Assignee: **Paragon Semiconductor Lighting Technology Co., Ltd.**, Taoyuan County (TW)

\* cited by examiner

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 237 days.

*Primary Examiner* — Jason M Crawford  
(74) *Attorney, Agent, or Firm* — Li & Cai Intellectual Property (USA) Office

(21) Appl. No.: **13/069,276**

(57) **ABSTRACT**

(22) Filed: **Mar. 22, 2011**

A light-mixing multichip package structure includes a substrate unit, a light-emitting unit, a frame unit, and a package unit. The light-emitting unit includes at least one first light-emitting module with red light-emitting chips and at least one second light-emitting module with blue light-emitting chips. The frame unit includes at least one first continuous colloid frame and at least one second continuous colloid frame respectively surrounding the first light-emitting module and the second light-emitting module. The package unit includes a transparent colloid body and a phosphor colloid body respectively covering the first light-emitting module and the second light-emitting module. Hence, when the red light source generated by matching the red light-emitting chips and the transparent colloid body and the white light source generated by matching the blue light-emitting chips and the phosphor colloid body are mixed with each other, the CRI of the light-mixing multichip package structure can be increased.

(65) **Prior Publication Data**

US 2012/0187865 A1 Jul. 26, 2012

(30) **Foreign Application Priority Data**

Jan. 26, 2011 (TW) ..... 100102836 A

(51) **Int. Cl.**  
**H05B 37/02** (2006.01)

(52) **U.S. Cl.**  
USPC ..... **315/294**; 315/312; 313/509; 313/512;  
362/231

(58) **Field of Classification Search** ..... 315/291,  
315/294, 312; 313/506, 509, 512; 362/231  
See application file for complete search history.

**20 Claims, 9 Drawing Sheets**

