US009410950B2

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

(10) **Patent No.: US 9,410,950 B2**
(45) **Date of Patent: Aug. 9, 2016**

(54) **LUMINESCENT GOLD NANOMATERIAL FUNCTIONALIZED BY N-(4-AMINOBUTYL)-N-ETHYLISOLUMINOL, PREPARATION AND APPLICATION THEREOF**

(75) Inventors: **Hua Cui**, Hefei (CN); **Dayong Tian**, Hefei (CN)

(73) Assignee: **University of Science and Technology of CHINA**, Hefei (CN)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 396 days.

(21) Appl. No.: **13/582,434**

(22) PCT Filed: **Jul. 8, 2010**

(86) PCT No.: **PCT/CN2010/075064**

§ 371 (c)(1),
(2), (4) Date: **Sep. 3, 2012**

(87) PCT Pub. No.: **WO2011/106963**

PCT Pub. Date: **Sep. 9, 2011**

(65) **Prior Publication Data**

US 2012/0329998 A1 Dec. 27, 2012

(30) **Foreign Application Priority Data**

Mar. 3, 2010 (CN) 2010 1 0117687

(51) **Int. Cl.**
G01N 21/76 (2006.01)
G01N 33/58 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G01N 33/54346*** (2013.01); ***G01N 33/553*** (2013.01); ***G01N 33/582*** (2013.01); *G01N 21/76* (2013.01)

(58) **Field of Classification Search**
CPC G01N 33/54346; G01N 33/553; G01N 33/582; G01N 21/76
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2005/0106570 A1* 5/2005 Kataoka et al. 435/6
2007/0154967 A1* 7/2007 Sundararajan et al. 435/7.92

(Continued)

OTHER PUBLICATIONS

Qi, H. et al., "Homogenous electrogenerated chemiluminescence immunoassay for human immunoglobulin G using N-(aminobutyl)-N-ethylisoluminol as luminescence label at gold nanoparticles modified paraffin-impregnated graphite electrode", Talanta (2008) 75(3):684-690.*

(Continued)

Primary Examiner — Mark Shibuya
Assistant Examiner — Gary E Hollinden
(74) *Attorney, Agent, or Firm* — Yuan Qing Jiang

(57) **ABSTRACT**

Provided is luminescent gold nanomaterial functionalized by N-(4-aminobutyl)-N-ethylisoluminol, methods of preparation and application thereof. The functionalized gold nanomaterial is formed by N-(4-aminobutyl)-N-ethylisoluminol bonding to the surface of the gold nanoparticle. The functionalized gold nanomaterial are prepared by directly reducing chloroauric acid with N-(4-aminobutyl)-N-ethylisoluminol, wherein N-(4-aminobutyl)-N-ethylisoluminol acts as reducer and stabilizer simultaneously. The preparation method is simple, fast and no need of special conditions. The preparation methods can be performed in a wide temperature range, for example, 15-35.degree. C. The size and pattern of the functionalized gold nanomaterial can be specified by choosing the ratio of chloroauric acid to N-(4-aminobutyl)-N-ethylisoluminol. The obtained functionalized gold nanomaterial exhibits excellent chemiluminescence properties. Said functionalized gold nanomaterial can be combined with biomolecules to form biomolecular probe, which can be used for immunoassay, nucleic acid analysis, molecular imaging, sensor, etc., and has a broad application prospect in the field of clinical analysis biomedicine, food safety, and environment monitoring.

18 Claims, 9 Drawing Sheets