(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
13 September 2007 (13.09.2007)

PCT

(10) International Publication Number
WO 2007/102799 A3

(51) International Patent Classification:
C30B 7/00 (2006.01) *C30B 29/60* (2006.01)

(21) International Application Number:
PCT/US2006/002065

(22) International Filing Date: 20 January 2006 (20.01.2006)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: **AGENCY FOR SCIENCE, TECHNOLOGY AND RESEARCH** [SG/SG]; 20 Bioolis Way, #07-01, Centros 138668 (SG).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **YING, Jackie, Y.** [US/SG]; 31 Toh Avenue, Singapore 508056 (SG). **ZHENG, Yuangang** [SG/SG]; 51 Mount Sinai Drive, #06-03, Ridgewood Condo 277107 (SG).

(74) Agent: **OYER, Timothy, J.**; WOLF, GREENFIELD & SACKS, P.c., 600 Atlantic Avenue, Boston, MA 02210 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(88) Date of publication of the international search report:
10 January 2008

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SYNTHESIS OF ALLOYED NANOCRYSTALS IN AQUEOUS OR WATER-SOLUBLE SOLVENTS

(57) Abstract: The present invention relates to nanocrystals and methods for making the same; in particular, the invention relates to ternary or higher alloyed nanocrystals and methods for making such structures in aqueous or water-soluble solvents. In certain embodiments of the invention, methods of preparing ternary or higher alloyed nanocrystals involve providing at least first, second, and third nanocrystal precursors (e.g., NaHSe, $ZnCl_2$, and $CdCl_2$) and forming nanocrystal structures in an aqueous or water-soluble solvent. In some cases, nanocrystal precursor solutions may also include a water-soluble ligand (e.g., glutathione, GSH). As such, ternary or higher alloyed nanocrystals (e.g., Zn_xCd)- $_x$Se) comprising the at least first, second, and third nanocrystal precursors may be formed, and the water-soluble ligand may coat at least a portion of the surface of the ternary or higher alloyed nanocrystal. Advantageously, methods for forming nanocrystals described herein can be performed at low temperatures (e.g., less than 100 degrees Celsius), and, in some embodiments, do not require the use of organic solvents. The present inventors have applied these methods to prepare blue-emitting nanocrystals with emissions that are tunable between 400-500 nm, and with quantum yields of greater than 25% in aqueous solution. These nanocrystals may be highly water soluble and can be used in a variety of applications, including those involving cell culture, sensing applications, fluorescence resonance energy transfer, and in light-emitting devices.

WO 2007/102799 A3