



- (51) **International Patent Classification:**
A01N 59/20 (2006.01) *A61M 5/32* (2006.01)
A01N 59/16 (2006.01)
- (21) **International Application Number:**
 PCT/US2012/039462
- (22) **International Filing Date:**
 24 May 2012 (24.05.2012)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
 61/519,523 24 May 2011 (24.05.2011) US
 61/582,322 31 December 2011 (31.12.2011) US
- (71) **Applicant (for all designated States except US):** AGIEN-
 IC, INC. [US/US]; 2711 Centerville Road, #400, Wilm-
 ington, Delaware 19808 (US).
- (72) **Inventors; and**
- (75) **Inventors/Applicants (for US only):** UHLMANN, Don-
 ald, R. [US/US]; 5309 East Mission Hills Drive, Tucson,
 Arizona 85718 (US). AGRAWAL, Anoop [US/US]; 4417
 East Cerrada Del Charro, Tucson, Arizona 85718 (US).
 AKARSU, Murat [TR/TR]; Meltem Mah. Ant-Belde
 Sitesi 1, Blok No: 8, 07030 Antalya (TR). CRONIN,
 John, P. [US/US]; 4545 North Osage Drive, Tucson, Ari-
 zona 85718 (US). LOPEZ-TONAZZI, Juan, Carlos
 [US/US]; 6400 North Montrose Drive, Tucson, Arizona
 85741 (US). REESER, Ryan, J. [US/US]; 8001 East Oco-
 tillo Drive, Tucson, Arizona 85750 (US).
- (74) **Agents:** JONES, Huw, R. et al.; Hayes Soloway P.C.,
 4640 E. Skyline Drive, Tucson, Arizona 85718 (US).
- (81) **Designated States (unless otherwise indicated, for every
 kind of national protection available):** AE, AG, AL, AM,
 AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
 CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
 DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
 HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR,
 KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME,
 MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
 OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD,
 SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
 TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States (unless otherwise indicated, for every
 kind of regional protection available):** ARIPO (BW, GH,
 GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ,
 UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,

[Continued on next page]

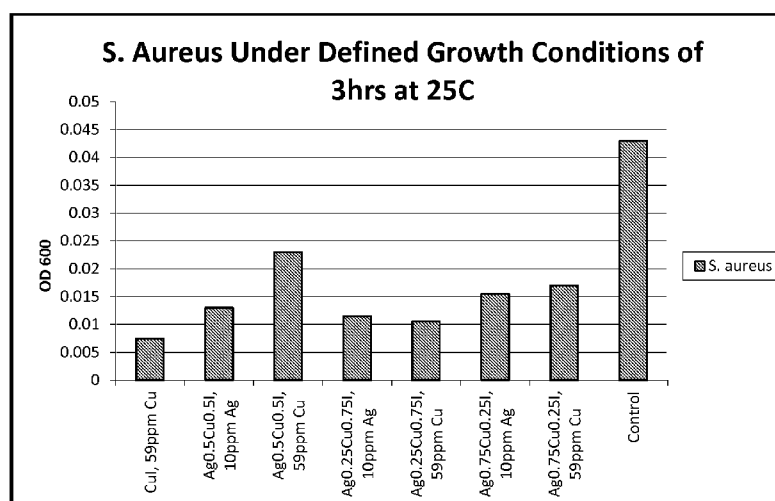
(54) **Title:** COMPOSITIONS AND METHODS FOR ANTIMICROBIAL METAL NANOPARTICLES

FIGURE 6

(57) **Abstract:** Embodiments of the invention are directed to a composition having antimicrobial activity comprising particles comprising at least one inorganic copper salt; and at least one functionalizing agent in contact with the particles, the functionalizing agent stabilizing the particle in a carrier such that an antimicrobially effective amount of ions are released into the environment of a microbe. The average size of the particles ranges from about 1000 nm to about 4 nm. Preferred copper salts include copper iodide, copper bromide and copper chloride. Preferred functionalizing agents include amino acids, thiols, hydrophilic polymers, emulsions of hydrophobic polymers and surfactants.



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).

Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*