

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
5 February 2004 (05.02.2004)

PCT

(10) International Publication Number
WO 2004/011901 A3

- (51) International Patent Classification⁷: **H01M 04/64**, 04/62, 04/80, 04/60, 06/00
- (21) International Application Number: PCT/US2003/022954
- (22) International Filing Date: 22 July 2003 (22.07.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/398,697 26 July 2002 (26.07.2002) US
10/354,405 30 January 2003 (30.01.2003) US
- (71) Applicant: **A123 SYSTEMS, INC.** [US/US]; 8 St. Mary's Street, Suite 611, Boston, MA 02215 (US).
- (72) Inventors: **HOLMAN, Richard, K.**; 104 Lewis Road, Belmont, MA 02478 (US). **CHIANG, Yet-Ming**; 52 Lake Road, Framingham, MA 01701 (US). **GOZDZ, Antoni, S.**; 24 O'Leary Road, Marlborough, MA 01752 (US). **LOXLEY, Andrew**; 181 Central Street, Apt. 2A, Somerville, MA 02145 (US). **NUNES, Benjamin**; 85 Glen Street, Somerville, MA 02145 (US). **OSTRAAT, Michele**; 56 plantation Road, Whitehouse Station, NJ 08889 (US). **RILEY, Gilbert, N., Jr.**; 630 Hemenway Street, Marlboro, MA 01752 (US). **VIOLA, Michael, S.**; 2 McCarthy Drive, Burlington, MA 01803 (US).
- (74) Agents: **SCOZZAFAVA, Mary Rose, Ph.D.** et al.; Hale and Dorr LLP, 60 State Street, Boston, MA 02109 (US).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (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: 24 June 2004
- 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: ELECTRODES AND RELATED DEVICES

(57) Abstract: The present invention relates generally to electrodes for use in electrochemical devices, and more particularly, to coated electrode particles for use in solid electrochemical cells, and to materials and systems for improving electronic conductivity and repulsive force characteristics of an electrode network. The present invention also relates to an article comprising a plurality of electroactive particles that form an electrode network wherein the electroactive particles are coated with a system of electrically conductive and low refractive index materials.



WO 2004/011901 A3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/22954

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H01M 04/64, 04/62, 04/80, 04/60, 06/00
 US CL : 429/233, 217, 232, 235, 236, 212; 29/623.5

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)
 U.S. : 429/233, 217, 232, 235, 236, 212; 29/623.5

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 EAST, WEST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2001/0007726 A (YOSHIOKA et al) 12 July 2001, see the whole document.	1-19, 22, 25-42, 45-50, 52, 54-61, 64, 66-75, 77, 79-91, 93-100, 102-112, 114-124
Y	US 2001/0005562 A (YOSHIOKA et al) 28 June 2001, see the whole document.	1-19, 22, 25-42, 45-50, 52, 54-61, 64, 66-75, 77, 79-91, 93-100, 102-112, 114-124
Y	US 2001/0005558 A (YOSHIOKA et al) 28 June 2001, see the whole document.	1-19, 22-23, 25-42, 45-50, 52-53, 54-61, 64-65, 66-75, 77-78, 79-91, 93-100, 102-112, 114-124




Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	
"P"	document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search 16 March 2004 (16.03.2004)	Date of mailing of the international search report 22 APR 2004
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230	Authorized officer Raymond Alejandro Telephone No. (703) 308-0661 

INTERNATIONAL SEARCH REPORT

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,096,454 A (TRAN et al) 01 August 2000, abstract, column 1, lines 10-65, column 2, lines 5-15, column 2, lines 36-50, column 4, lines 30-50, col 5, lines 15-25; col 5, lines 60-67, col 6, lines 40-67.	1-5, 7-18, 20, 23, 26-43, 45-49, 53-60, 62, 65-68, 70-74, 76, 78-79, 81-86, 89-90, 92, 93-94, 101, 105-124
Y	US 6,306,540 A (HIROI et al) 23 October 2001, column 1, lines 35-45, column 2, lines 55-60, column 4, lines 41-67.	5-6, 38-44, 52, 64, 66, 69, 77, 88, 95-104, 111, 113
Y	US 5,759,714 A (MATSUFUJI et al) 2 June 1998, column 7, lines 48-67, column 12, lines 51-60, column 13, lines 30-55.	40, 43-44
Y	JP 04-58455 B (YUASA CORP.) 25 February 1992, see the whole document.	1-4, 7-10, 13-15, 17-19, 26-37, 46-50, 54, 56-60, 66, 67-68, 70-71, 74, 79, 81-86, 93-94, 105-106, 108-110, 114-115, 122-123
Y	US 5,902,689 A (VLEGGAR et al) 11 May 1999, column 4, lines 1-10.	21, 63
Y	US 2002/0015278 A (FUKUYAMA et al) 7 February 2002, paragraphs 30 & 45.	21, 63
Y	US 5,789,100 A (BURROUGHS et al) 4 August 1998, column 15, lines 54-67.	24
Y	US 6,136,476 A (SCHUTTS et al) 24 October 2000, column 3, lines 41-65.	24
Y	US 5,213,895 A (HIRAI et al) 25 May 1993, column 13, lines 20-30.	113
Y	US 5,187,209 A (HIRAI et al) 16 February 1993, column 26, line 67 to column 27, line 5.	113