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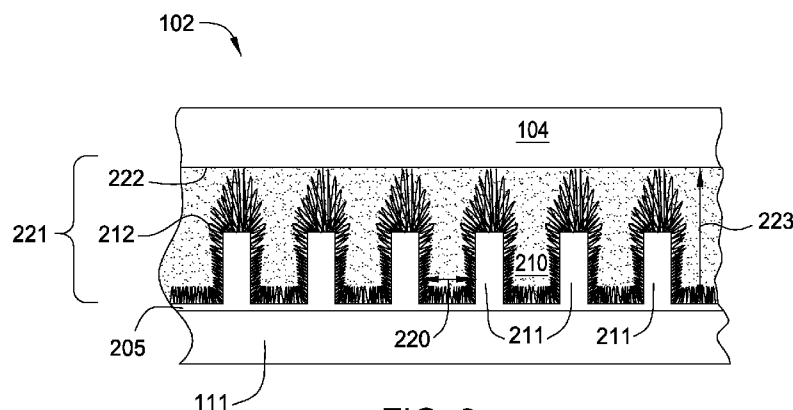


FIG. 3

(57) Abstract: High capacity energy storage devices and energy storage device components, and more specifically, to a system and method for fabricating such high capacity energy storage devices and storage device components using processes that form three-dimensional porous structures are provided. In one embodiment, an anode structure for use in a high capacity energy storage device, comprising a conductive collector substrate, a three-dimensional copper-tin-iron porous conductive matrix formed on one or more surfaces of the conductive collector substrate, comprising a plurality of meso-porous structures formed over the conductive current collector, and an anodically active material deposited over the three-dimensional copper-tin-iron porous conductive matrix is provided. In certain embodiments, the three-dimensional copper-tin-iron porous conductive matrix further comprises a plurality of columnar projections formed on the conductive current collector with the plurality of meso-porous structure formed on the plurality of columnar projections.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/026991**A. CLASSIFICATION OF SUBJECT MATTER*****H01M 4/13(2010.01)i, H01M 4/64(2006.01)i, H01M 10/052(2010.01)i, H01M 4/139(2010.01)i***

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)

H01M 4/13; H01M 2/16; C25D 5/00; B05D 5/12; C25B 11/10; C25D 15/02; H01M 4/02; H01M 4/44; H01M 4/04

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: anode,collector,copper-tin-iron, porous ,meso porous,active material.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010-0216026 A1 (LOPATIN, SERGEY D. et al.) 26 August 2010 See the whole document.	1-15
A	US 2010-0330425 A1 (LOPATIN, SERGEY D. et al.) 30 December 2010 See the whole document.	1-15
A	US 2009-0280407 A1 (ITO, SHUJI et al.) 12 November 2009 See the whole document.	1-15
A	US 2008-0248189 A1 (OHTSUKA, TAKASHI et al.) 09 October 2008 See the whole document.	1-15
A	US 2010-0200403 A1 (LOPATIN, SERGEY D. et al.) 12 August 2010 See the whole document.	1-15

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010-0216026 A1	26.08.2010	CN 102405545 A	04.04.2012
		EP 2393959 A2	14.12.2011
		EP 2394322 A2	14.12.2011
		KR 10-2011-0122177 A	09.11.2011
		KR 10-2011-0122842 A	11.11.2011
		KR 10-2011-0123272 A	14.11.2011
		TW 201034276 A	16.09.2010
		TW 201035383 A	01.10.2010
		US 2010-0193365 A1	05.08.2010
		US 2010-0203391 A1	12.08.2010
		US 8206569 B2	26.06.2012
		WO 2010-090956 A2	12.08.2010
		WO 2010-090956 A3	12.08.2010
		WO 2010-091352 A2	12.08.2010
		WO 2010-091352 A3	12.08.2010
		WO 2010-098977 A2	02.09.2010
		WO 2010-098977 A3	20.01.2011
US 2010-0330425 A1	30.12.2010	KR 10-2012-0050983 A	21.05.2012
		TW 201106524 A	16.02.2011
		WO 2011-008539 A2	20.01.2011
		WO 2011-008539 A3	30.06.2011
US 2009-0280407 A1	12.11.2009	CN 101507022 A	12.08.2009
		CN 101529566 A	09.09.2009
		CN 101529566 B	16.11.2011
		CN 101573696 A	04.11.2009
		EP 2056381 A1	06.05.2009
		EP 2056381 A4	05.01.2011
		EP 2056381 B1	20.06.2012
		EP 2096666 A1	02.09.2009
		EP 2101268 A1	16.09.2009
		EP 2372821 A2	05.10.2011
		EP 2372821 A3	23.11.2011
		EP 2372822 A2	05.10.2011
		EP 2372822 A3	30.11.2011
		JP 04-405503 B2	13.11.2009
		JP 04-445030 B2	22.01.2010
		JP 04-642835 B2	10.12.2010
		JP 04-647014 B2	17.12.2010
		JP 2008-165633 A	17.07.2008
		JP 2009-099512 A	07.05.2009
		JP 2009-164137 A	23.07.2009
		JP 4405503 B2	27.01.2010
		JP 4445030 B2	07.04.2010
		JP 4642835 B2	02.03.2011
		JP 4647014 B2	09.03.2011
		JP W02008-078755 A1	03.07.2008
		JP W02008-081806 A1	10.07.2008

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/026991

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		KR 10-1067034 B1	22.09.2011
		KR 10-1073421 B1	17.10.2011
		KR 10-1083868 B1	15.11.2011
		KR 10-1135418 B1	17.04.2012
		KR 10-1148610 B1	21.05.2012
		KR 10-2009-0042788 A	30.04.2009
		KR 10-2011-0077001 A	06.07.2011
		TW 200839946 A	01.10.2008
		US 2008-0256207 A1	16.10.2008
		US 2009-0303406 A1	10.12.2009
		US 8218122 B2	10.07.2012
		WO 2008-078755 A1	03.07.2008
		WO 2008-081806 A1	10.07.2008
		WO 2008-081967 A1	10.07.2008
US 2008-0248189 A1	09.10.2008	JP 2008-277256 A	13.11.2008
US 2010-0200403 A1	12.08.2010	CN 102257583 A	23.11.2011
		KR 10-2011-0118717 A	31.10.2011
		US 8192605 B2	05.06.2012
		WO 2010-091405 A2	12.08.2010
		WO 2010-091405 A3	09.12.2010